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CONSPECTUS
MEDICINÆ THEORETICÆ,

OR

A VIEW

OF THE

THEORY OF MEDICINE.

BY

THE LATE JAMES GREGORY, M. D.

FORMERLY PROFESSOR OF THE THEORY OF MEDICINE, AFTERWARDS OF
THE PRACTICE OF MEDICINE IN THE UNIVERSITY OF EDINBURGH.

IN TWO PARTS.

PART I. CONTAINING PHYSIOLOGY AND PATHOLOGY.
PART II. CONTAINING THERAPEUTICS.

TRANSLATED FROM THE ORIGINAL LATIN.

ENUMERARE possum quae sit in figuris animantium, et quam solers subtilisque descriptio partium, quamque admirabilis fabrica membrorum. Omnia enim, quae quidem intus inclusa sunt, ita nata, atque ita locata sunt, ut nihil eorum supervacaneum sit, nihil ad vitam retinendam, non necessarium. Faciliusque intelligetur, a Diis immortalibus hominibus esse provisum, si erit tota hominis fabricatio perspecta, omnisque humanae naturae figura atque perfectio.—CICERO.

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ADVERTISEMENT.

The Conspectus Medicinae Theoreticae of Dr. Gregory, has been so well received by those for whose use it was intended, that several Editions have been called for, even since it ceased to be a text book to the Author's Lectures on the subject. Of a Dissertation prefixed to his work, a considerable part is employed in giving his reasons for writing it in Latin; and therefore an apology may be thought necessary for a translation. But the work itself is so valuable, and the lamented Author's name so celebrated as a man of general knowledge, as well as of medical skill, that it was thought an injury, both to the interests of medical science, and to the Author's fame, to allow such a work to remain inaccessible to all but the learned. The difficulty was to give such a translation as might do justice to the beauty and splendour of the original language. This it was thought better not to attempt, but to keep closely to the sense, so that what the version wants in elegance may not be attributed to the Author, leaving the translator answerable for fidelity alone.

The history of medicine from the time when diseases were ascribed to the stars, to the anger of the deity and to magic, down to the present time, forms the remainder of the Dissertation. This being more a matter of curiosity than of general interest, and at the same time now to be found in many other works in our own language, it was not thought necessary to translate.

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A

CONSPECTUS

OR

BRIEF VIEW

OF THE

THEORY OF MEDICINE.

CHAP. I.

Some general preliminary observations on the functions of the living body; on the nature and causes of diseases; on those powers naturally inherent in the body which tend to preserve health and remove disease; and also on the nature, powers, and effects of remedies.

1. THE human body, fabricated with a skill altogether divine, performs many admirable functions; of which, some relate to external objects, others to itself alone.

2. To the former class belong the senses and voluntary motion; by which powers, however simple, we acquire our knowledge of the external world, and become masters of the earth: by medical men, these are called animal functions.

3. We are not, however, at all times adequate to these functions; for by long continued or vigorous exercise, either of body or mind, the *vis insita* of both is exhausted. And in this state we are quickly admonished, and, at last, by grateful necessity compelled, as well to intermit all our labours and pleasures, as to lay

aside our cares, and to commit ourselves weary and languid to the arms of sleep, in whose bosom being cherished and refreshed, we rise with renewed vigour and alacrity, and completely fitted for all the functions of life.

4. To the other class are usually referred all those actions by means of which the body lives, by which it is recruited, when exhausted, and purified when corrupted. These, again, are either vital, or natural functions.

5. Those functions are called vital which are so necessary to life, that, without manifest danger to it, they cannot even for the smallest portion of time be suspended or interrupted: such are, the action of the brain and nerves, the circulation of the blood, and respiration.

6. But, such being the constitution of the animal machine, it must immediately begin to decay, and would quickly be destroyed: for by every motion the solid parts are worn down, the fluids are dissipated, leaving the body feeble, emaciated, and exhausted; besides, each of these having a tendency to putrefaction and corruption, man would naturally furnish to himself a most deleterious poison.

7. But no where does kind nature forsake her offspring. On the contrary, she not only suggests a remedy for those evils which at all times and places threaten death, and which, if not provided against, would, doubtless, inflict it; but also, by an admirable contrivance, has provided, that, from this very necessity, man should derive renewed and lasting vigour.

8. For the body being worn down, and part of the humours consumed, a supply of both solid and liquid nourishment becomes necessary; an ardent desire or appetite is excited for food and drink; we use, and digest them; when digested, each is diffused through the whole body; wherever it is required it is deposited; what remains of either is ejected. Humours which are putrescent, or otherwise depraved, are also secreted from the rest, and by appropriate channels discharged from the body. In fine, a process of secretion is in-

cessantly going on, by which many juices are separated from the general mass, differing from that, and among themselves, and adapted to various uses within the body.

9. These functions, namely, digestion, secretion, and excretion, are called natural functions, which are necessary indeed to life, but may, for a little time, be suspended with ease and safety.

10. By the vital and natural functions, then, man lives and grows; his body is recruited and purified, and becomes fit for exercising the animal functions: a noble work, which the Supreme Being alone could have contrived; certainly so far exceeding all human ingenuity, that, though it has been so often the object of research, it cannot be comprehended even by the most sagacious mind; nor are the functions of particular parts, the connections of the whole, or the source and origin of the powers by which the machine is moved, hitherto clearly discovered.

11. For, except the animal frame, there is no piece of machinery self-moved; none that spontaneously wards off the dangers which threaten it, or administers to itself the requisite supplies.

12. On the first view of such a machine we are ready to conclude that, unless accidentally depraved or injured by some external cause, it is formed for perpetuity: and, indeed, it is from experience alone that we learn the contrary. For man, though now healthy, robust, and vigorous, decays with the lapse of years, shrinks, dies, and is reduced to his pristine elements, to furnish nutriment to other animated beings.

13. This, however, is nature's law, this is her plan, that the individual should perish, but the race be perpetuated. Hence the distinction of sex; hence generation and progeny; with all the sweets, and all the bitters, that attend the intercourse of the sexes.

14. But man himself, lord of the earth, and of the animals which inhabit it, is born of small size, feeble in body, weak in mind, and in want of all things. For a considerable time he is preserved, clothed, and fed, by parental care alone; he gradually advances in sta-

ture, reaches the years of puberty, of manhood, and of discretion ; attains to an equality with his parents in form, and in the powers of body and mind ; enjoys the exercise of the same functions ; and, under the increasing weight of years, at last submits to the common destiny.

15. These remarks apply to the whole human race ; but individuals have many things peculiar to each. In constitution of body, as in features, there are many varieties. These can by no means be fully specified ; they are, however, usually, and not unaptly, referred to certain heads, called for distinction's sake *temperaments*, the knowledge of which is of great advantage to the practitioner.

16. Such varieties are observed, not only in body, but also in mind, generally congenital, sometimes hereditary ; in this way parents often revive in their posterity. Beyond all doubt children resemble their parents, not only in their countenance and shape, but in their disposition of mind, their virtues and their vices. The imperious family of the Claudii, during the long time that it flourished at Rome, was always distinguished by the same character, indefatigable, fierce, and haughty. The same family produced the inexorable *Tiberius*, the sternest of despots ; and closing a period of six hundred years with a frantic *Caligula*, a *Claudius*, and an *Agrippina*, was finally extinguished in *Nero*, another name for tyranny itself.

17. Moreover, though the health remain unimpaired, the human body is the subject of many and important changes from other causes, especially from the employment or mode of life, from the food which we use, from the climate in which we live, and from the unbounded power of habit : with these also the practitioner should be acquainted.

18. Good health, therefore, can neither be precisely defined, nor, indeed, easily described, seeing nature herself has for wise purposes varied it. It is, however, worthy of observation, that health in its most perfect state is found in that man, who, in the flower of

age, is favoured with that most excellent gift of God,—a sound mind; which is not only adequate to the usual functions, but likewise accommodates itself with ease to the various accidents, studies, and bustle of life; which being possessed of nice sensibility, discernment, and retentive power, has its perceptions, judgment, and memory in due perfection; which is firm and serene, whether disposed to the grave or to the cheerful mood; always self-possessed, never the sport of it's own irregular emotions, or external accidents; the master not the slave of it's own affections; enjoying prosperity with moderation, bearing adversity with fortitude, and, when assailed by more serious calamities, roused, not distracted. These, indeed, are symptoms and evidences, not of a sound mind only, but of a sound body too, to which they in fact contribute in no small degree; seeing the mind, while inclosed in it's corporeal frame, both deeply affects the body, and is reciprocally affected by it.

19. As for the body, it is, in general, most vigorous and healthy, when it is of the proper size and well formed; of stature neither too tall nor too low; neither spare nor corpulent, but square built rather than slender; furnished especially with an ample chest and broad shoulders; the bones should be large, the muscles brawny, well defined, firm, and strong, never tremulous; the skin soft and moist, never arid; the colour, in the face particularly, whether fair or brown, steadily good, never inclining to yellow or pale; the countenance fresh and cheerful, eyes glistening and lively, and teeth sound and strong; the gait erect, the step firm, and the limbs supporting the trunk in a proper manner; every exercise easy, and labour, though lengthened and severe, not exhausting; all the organs of the external senses neither torpid nor of too exquisite feeling, but in proper condition for their respective functions; the slumbers light and lasting, not easily broken, very refreshing to the body, either entirely undisturbed by dreams, or, at least, by those of a horrible description,—calculated either to bury one in placid

rest and pleasing oblivion of life, or sweetly to refresh the mind with agreeable images. Additional evidences of a healthy body are—a moderate circulation, the pulsation of the arteries strong, full, soft, regular; not too frequent, nor too slow, nor easily stimulated beyond the usual course; the respiration full, easy, slow, not very discernible, nor much accelerated by exercise; the voice strong and sonorous, of deep tone in men, not readily becoming hoarse; the breath agreeable, at least inoffensive; the mouth moist, the tongue clean, but not too red; the appetite good, requiring no sauce; thirst moderate; digestion of every kind of food easy and good, without irritation, or any feeling of oppression in the stomach; the stools natural and recurring daily; the urine easily retained during a convenient length of time, and then as easily discharged; and though varying it's colour, consistency, and quantity, according to the nature of the food or drink taken in, depositing a proper sediment in due time, in general, the slower the better; the perspiration free and constant, but without sweat, except on occasion of extraordinary exertions; the internal secretions equally constant and free, offending neither in excess nor defect. In fine, it is the property of a healthy man to desire the sexual intercourse, to have the power of enjoying it, and to procreate children.—So far as women have parts bestowed on them, and functions to perform very different from those of men, their health has no doubt some things peculiar and appropriate. It consists in the regular and free flux of the menses, neither too abundant nor too sparing; a happy pregnancy, easy parturition, and in due time a copious secretion of good milk. Besides, in either sex, it may be expected of a sound and vigorous body, that it not only perform well all its functions when meeting no impediment, but that, tenacious of its state of perfection, it accommodate itself to the many varieties of climate, food, and manner of life, and thus bear without injury many causes of disease, which, in a body of inferior soundness or vigour, would have altogether broken the health, or brought it into extreme danger. Lastly, the health of the same person, though always excellent, is not precisely uniform. Advancing years alone produce many and important changes on the body; and no man differs so widely from others of the same age, as he does from himself at different periods of life; whether we attend to the form, the powers of the body, or endowments of the mind, or, in a word, scrutinize the internal parts and their appropriate functions. Whence it is that health, the most perfect possible, which has conducted the body from it's diminutive and delicate state to its vigour and perfection, and which has long sustained it in this state, again impairs it by little and little, and at last conducts it to it's end; for

> "*Nascentes morimur, finisque ab origine pendet.*"

20. The knowledge of those things which relate to the sound body is called the *Physiology* of the human body.

21. But, indeed, according to the laws of nature, man has not only a definite period for his birth, his growth, his vigour, decay, and death; but is also obnoxious to various and almost innumerable diseases, which undermine the fairest form, impair the strength, impede the several actions of the body, often torment it with severe pain, and spare not even the mind itself, that "*Divinae particula aurae.*"

22. Of these some attack the infant perhaps at birth, and not seldom carry him off; some more readily assail the youth in the full confidence of his strength, cutting down one by sudden death, another by lingering hectic; while others beset the path of declining age, the more easily to oppress the body, when feeble, exhausted, and unequal to the contest; or, if they do not crush it instantly, they waste it with tedious illness, till at last life, become completely helpless and wretched, is gladly exchanged for a welcome death.

23. Diseases so numerous, various, and severe, must proceed from a great variety of causes. The knowledge of these, of their nature, their seat, their effects, and the manner in which they operate on the human body, is called *Pathology*. This again is either general or

particular: the principles of the former only are exhibited in the following view.

24. Disease is present, when the body has so far declined from its sound state that it's ordinary actions are either entirely impeded, or performed with difficulty or pain: then one is said to be sick. Every part of the body, whether fluid or solid, and every function is liable to injuries peculiar to it. These again may occur singly or in conjunction; hence diseases are simple or compound.

25. Those are the simplest cases of disease, in which any part of the body is lacerated, or otherwise injured, and rendered less capable of exercising its proper functions; or in which the part itself, whether solid or fluid, while it's structure remains entire, has departed from a sound state, and with the loss or depravation of it's native qualities, has acquired others, perhaps noxious ones; or, in a word, when the moving powers are too great, too small, or act in an irregular manner.

26. Disease, however, in this simple form, is very seldom presented to the eye of the body; in general we attain a view of it with the mind's eye alone: as even the most simple diseases produce others or tokens of disease called *Symptoms*, by which one is distinguished from another. Every thing preternatural in a patient is a token or *symptom;* but the chief, the most evident, and most constant of them, constitute and define the disease; one symptom producing another, and the first proceeding from the cause of disease itself.

27. The symptoms of disease, the knowledge of which is of the utmost importance to the medical practitioner, both for enabling him to distinguish diseases, and to prescribe for their cure or alleviation, are exceedingly various and almost innumerable. But that immense variety is usually and very properly referred to three general heads: namely, impeded functions; uneasy sensations or perceptions; and the altered appearance of the body, or the change or vitiation of it's other manifest and sensible qualities. For every disease consists chiefly (24) in the injury which some of

the functions have sustained; but scarcely any one of these can be injured or impeded, without speedily producing some uneasiness to the patient, by which he may be apprised of his diseased condition. And, generally speaking, no person can be long sick without suffering more or less in the appearance and form of the body, and in that comeliness of complexion which usually attends a good state of health, and of which it forms so fine an expression (19).

28. A physician, therefore, in marking the symptoms of bad health, must in the first place attend to the signs of impaired animal functions, namely, those circumstances which shew that sense and voluntary motion are in a morbid state. For all the external senses may be, and in fact often are, vitiated in a variety of ways; they become defective and torpid; too acute, and cannot be exercised without pain; or they become irregular and depraved. The internal senses, too, are often affected by disease: and therefore affections of them become proper objects of the physician's attention, not only as being themselves diseases, and sometimes of considerable importance, but also, as, on many occasions, decisively pointing out the nature, increase, and remission of other important diseases.

29. For a similar reason, attention is always to be given to the condition in which the moving power is found, or the injuries which it has sustained: whether it be defective, as it commonly is in most diseases, which defect is termed debility; or lost, as in palsy; or preternaturally intense, which sometimes happens in certain affections of the brain; or finally, whether it be irregular, as in convulsions, and other similar diseases.

30. The patient's condition as to sleep must not be neglected, whether sleep be viewed as a function of the body, or merely as an intermission of other functions. In consistency with the laws of health, it has it's own peculiar *modus*, which in disease is usually disturbed in a considerable degree. There may be no sleep, or too much: it may be interrupted, or rendered terrific by

horrible dreams; and that which is obtained may not be attended with it's usual refreshing effects.

31. But the symptoms of the injury or depravation of the vital (5) functions are of still greater importance, inasmuch as they are not only well suited to point out the nature of the disease and state of the patient, but are attended, especially if they be violent, with dangers peculiar to themselves. To this class belong the variations of the pulse which shew that the circulation is either in defect or excess, or irregular, as in fevers, inflammations, or faintings.

32. Next to these in importance are the morbid affections of the respiration; such as every unusual degree of velocity or retardation; or any difficulty attending it, as coughing, sneezing, sighing, and the like; to which may perhaps be added the various affections of the voice, though these, indeed, should rather be referred to the first class (29).

33. Farther, the symptoms of the natural actions being injured, are to be carefully observed: namely, defect or excess, depravation, or any unusual state of the appetites of hunger and thirst; the various disorders of the actions of mastication, of deglutition, or of digestion; the state of the bowels, whether costive or too lax; the excess or defect, difficulty or depraved state of the secretions;—and which are still more obvious to our senses,—the excretions, particularly those of urine and sweat. Nor must attention be withdrawn from the injuries sustained in the functions peculiar to either sex, to the female especially.

34. As to disagreeable or irksome sensations, they are well known to be most frequent attendants and symptoms of diseases, few of which want their own portion, at least, of uneasiness. For, as, on the one hand, the man of sound health, in the easy performance of his various functions, enjoys a certain degree of pleasure; so, on the other, these functions being impeded by illness, he becomes pained, anxious, and is affected with various uneasinesses. To this class, therefore, belong pain, anxiety, and itching; together with a sensation

of lassitude, torpor, or stupor, of heat, or cold, or of heaviness; and perhaps not a few other unpleasant feelings, such as nausea, vertigo, ringing of the ears, &c. which medical men have been pleased to arrange under other classes. Of these the power and uneasiness is often such that they constitute great part of the disease; and so miserably agitate, torture, and terrify the unhappy patient, that they become more terrible to him than death itself: and, in fact, such distressing feelings, whatever may have been their cause, are not always unattended with danger.

35. To the third class of morbid symptoms (27), namely, the vitiated state of the manifest qualities of the body, may be referred all those preternatural circumstances in the patient, the knowledge of which we acquire by our own senses, not from the intimations or complaints of the sick, and which are not referable to the other classes. Such are—the diseased colour of the body, particularly of the face, when unusually pale, ruddy, yellow, dark, livid, or changeable; also that peculiar and never to be neglected aspect of the countenance, depending on the action of the muscles, the motion of the blood, and often on the state of the mind,—which, though indescribable, depicts more expressively and certainly than by any words, the condition of the patient as to the vital powers, or the abatement or increase of the disease; chiefly the various circumstances of the eyes, their languor and dullness, redness or brightness, uncommon ferocity, or unusual distortion,—also other morbid appearances, as when they seem sunk, or one or both shut, or the one appearing larger than the other in any unusual degree. The state of the mouth also requires to be diligently observed; especially, whether the tongue be red or white, foul, black, or parched: circumstances which, by their presence, often shew the presence of disease; while their removal or change for the better, is an evidence of recovery. Farther, several morbid smells sometimes detect the nature of disease, and therefore deserve to be noticed; such as, the odour, or unusually fetid smell of the breath,

of the perspiration, of the several excretions, of the whole body, or any part of it; as in cancer, smallpox, or putrid diseases. Strict attention is also required to many vitiated qualities of the body perceptible chiefly by the sense of touch; as the heat, cold, hardness or rigidity, softness, humidity, or dryness, thickness or thinness, tumefaction or emaciation,—either of the whole body or of particular parts. Attention, too, is the more advantageously bestowed on such diseased affections of the manifest qualities of the body, because being observed without difficulty, they are not calculated to mislead; and as the patient cannot conceal them from his medical attendant, the latter may understand the case without the task, often an ungrateful one, of many interrogatories.

36. When medical men treat of diseases they use the term *cause* with great latitude of meaning, and in a sense somewhat different from it's ordinary acceptation in the writings of philosophers, or in common speech. It is therefore incumbent on every student of medicine to know the several medical applications of the term, or, at least, those that are in most frequent use.

37. Medical writers distinguish the causes of disease into *proximate* and *remote*; and the remote again into *predisposing*, and *occasional*: the occasional being otherwise denominated *exciting* causes, or *noxious powers*.

38. The *proximate* cause, as defined by medical writers, is that which, being present, removed, or changed, the disease is present, removed, or changed accordingly.

39. The *predisposing* cause is that which merely renders the body liable to become diseased on the application of an exciting cause.

40. Finally, the *occasional* or *exciting* cause is that which actually excites disease in the body already predisposed to it (39).

41. That condition, therefore, of the body, which renders it obnoxious to disease, is to be corrected; the remote exciting causes of disease are to be avoided; the

proximate cause is to be removed; and the most troublesome symptoms, are to be mitigated. Thus are diseases prevented, alleviated or cured.

42. The more remote cause, which merely produces a predisposition to disease, is always inherent in the body itself, though it may often be traced to an external origin: but the exciting cause may be either internal or external. The concurrence of both produces disease, which neither of them alone could effect. For every exciting cause of disease does not produce disease in every person: nor, in the absence of an exciting cause, do all contract diseases who have already become predisposed to them.

43. The body, then, when predisposed to disease, seems to have somewhat declined from it's sound and most perfect state, though it's actions be not yet so far impeded as, with propriety, to be termed disease (24). But sometimes such a habit of body, by long continuance, is aggravated to that degree, that alone, without the addition of any exciting cause, it becomes a proper and manifest disease: or, as some love to speak, it becomes also an exciting cause. Take for example the general debility of the solids, the excessive mobility of those which are called, for distinction's sake, the living solids, and the fulness of the body from too great abundance of blood.

44. Nor has any man such firm health, or vigour of body, as will secure him against very severe diseases, on the application of certain exciting causes. Persons of the soundest health may once in their life be infected with the *small pox*, and repeatedly by the *lues venerea*. Poisons kill, and excess of heat or cold injures in many different ways.

45. The exciting cause, likewise, though it do not immediately induce disease, if long continued, will gradually undermine even the strongest constitution, and render it obnoxious to various diseases; producing, in fact, the other remote cause (the predisposing cause), or being converted into it. The same circumstance, then, may be at one time the exciting cause, and, at

another, the more remote cause. An intemperate climate, indolence, and luxury, are instances of this.

46. Farther, concerning these three descriptions of causes of disease, it deserves remark that the idea formed of both kinds of remote causes (37) is definite, and of great importance in medical practice. For though medical men have been often greatly mistaken concerning the remote causes of various diseases, when they presumed to decide hastily concerning them; yet the general notions which they formed of them in their minds were correct; and the remote causes, both predisposing and exciting, of many diseases, have by observation and experiment, and by sober reasoning, become sufficiently known and ascertained: and the knowledge of them is of the greatest advantage to practitioners.

47. But with respect to the proximate cause, the general conception of it, if not utterly false, is, at least, very confused, obscure, and formed from too hasty a view of facts. For medical men, not readily finding the cause for which they are in search, invent to themselves some cause of every disease, whence that disease may arise, nearly in the same manner in which the various changes or effects observable in inanimate objects, proceed from their causes. But in most of the affections which we call diseases, nothing of that kind appears to exist, or, indeed, can exist; and such a notion plainly arises from a misapprehension of the nature both of body itself, and of the diseases incident to it. For disease is an event or change, not one or simple, such as we are accustomed to contemplate in inanimate objects, and which we call an effect; but a series, frequently a long one, of such events or changes, one of which appears to be the cause of another (26). It may happen, indeed, that one or two of those being removed, the whole series may either be interrupted, or terminate in a short time, and thus the disease give place to health. But this is by no means uniformly the case, either in every disease, or in almost any disease at all times. Besides, the body itself differs very much from inanimate objects in respect to the changes which take place

in it, and the causes, external or internal, whence they proceed. For in the living body there exists some principle of change, resembling in some measure that which is observable in plants, and differing widely from the nature of inanimate matter, a principle not easily defined, and not yet investigated with the requisite diligence and accuracy. It is with propriety named the vital principle, to which, not less than to the causes commonly observed, numerous changes, both morbid and salutary, which affect the body, are to be attributed. As this is the case, it is not at all surprising that many theories of practitioners concerning the *proximate* causes of various diseases, are altogether futile, and not only false, but so confused and obscure, that they scarcely can be understood, and probably never were understood sufficiently by their authors themselves.

48. But whence originates disease or it's causes? Certainly in the first place, from the very constitution of the animal machine. As glass issues from the manufactory in a brittle state, so men are born feeble, fading, and obnoxious to disease. Accordingly many diseases are common to all, provided the proper exciting cause be applied: but some persons, more readily than others, are afflicted with particular diseases: for this there are manifold reasons.

31 49. As a healthy parent produces a healthy progeny, so the diseased parent has a diseased offspring. Thus hereditary diseases are transmitted to distant posterity; and in this way we often innocently suffer for the faults of our ancestors. Some of these diseases begin to appear in the earliest period of life; some attack every age alike; nor are there wanting others which lurk in concealment till the most advanced age, unsuspected, when having acquired strength by degrees, they at last break out with the greater severity, every one in it's own time.

50. Some diseases or disorders are born with us, yet are not congenital; as when the foetus, while yet in utero, without injury to the mother, suffers some injury from accident only. Perhaps there may occur diseases neither

congenital, nor coeval with the birth, which the infant may have drawn from it's nurse with it's first milk.

51. Again, there are some which attend the several stages of life; and each it's own period: namely, such diseases as have their origin in those changes which the body undergoes at these several periods. Hence are the various diseases of infancy, youth, and old age.

52. Farther, each sex, the female especially, has it's peculiar diseases, proceeding both from the general habit of body, and likewise from the particular structure, state, and use of the parts subservient to generation. Thus there are diseases of men, and diseases of women; and of these last some are peculiar to the several states of virginity, pregnancy, childbirth, nursing, and to that of those past child-bearing.

53. The climate itself, in which persons live, sometimes produces disease. Doubtless every region has it's own peculiar fault, is too warm, or too cold, or variable, and liable to many sudden changes of temperature.

54. Again, the very atmosphere, which, when pure, feeds the sacred flame of life, having become impure, may instantly extinguish it: or being loaded with many vapours, or corrupted with noxious effluvia, induce a vast train of diseases.

55. The food and drink too which we use are often corrupted, and sometimes adulterated with substances very injurious to health and life: but though they be in their own nature of the very best quality, if taken in too great quantity, they will sooner or later prove noxious to the body.

56. Farther, there are poisons of such fatal efficacy, that when received into the body in the smallest quantity, so as to be scarcely, or indeed not at all obvious to the senses, they induce the most terrible diseases, or perhaps inevitable death.

57. In fine, man is exposed to innumerable accidents, and often to the greatest dangers. For the most part, indeed, he escapes unhurt, yet he is frequently so unhappy as to fall a victim: often he escapes with difficul-

ty, with wounds, contusions, fractured, or dislocated limbs; and these sometimes utterly incurable. And accidents of this sort, though originating in an external cause, frequently terminate in internal diseases.

58. All these dangers are external, and the internal are no less formidable.

59. In respiration man breathes forth a vapour, which, if inhaled by himself or others, would prove a deadly poison. Nor is the vapour expired from the lungs the only one of a noxious quality: a most subtile, virulent, and perhaps putrescent matter, issues from every pore of the skin, which, when long collected, and not dissipated through the atmosphere, but applied anew to the body, or again received into it, infects it with the severest diseases; nor does it stop here, but acquiring strength as it were with it's aliment, it extends it's ravages far and wide.

60. The animal functions also, which are voluntary, are frequently neglected or too much exercised. There is danger in both extremes. By indolence either of body or mind, the powers of both become languid; they are no less injured by too violent exercise. For the provident Parent of all has ordained that the powers of particular parts, or of the whole body, and of the mind also, should acquire vigor and acuteness by exercise; and to this again certain limits are assigned; so that the use which nature intended cannot, with impunity, be either omitted or immoderately extended. From this circumstance, athletics on the one hand, and the idle or indolent on the other, are equally liable to diseases, but each class to those peculiar to itself. On the same principle, injury is sustained from the total want, or from the excess of mental exertion. Hence also arise the many diseases to which different classes of artisans are subject, whose health and symmetry are generally impaired; because being always occupied in the same employment, and that possibly unfriendly to health, they exercise certain parts of the body very much, perhaps to excess, while they make little use of many other parts; or perhaps, by an improper position of the body,

or depraved mode of living, their functions are greatly impeded; and thus, while, in the use of certain parts, they acquire a wonderful dexterity and strength, they lose the general vigour of the body, and that thriving state of health which depends upon it.

61. But the health may also be exposed to no small danger by those functions, both of mind and body, which are not subject to the will. The affections of the mind especially, (which, when moderate, produce a grateful excitement,) if they be violent, or depressing and of long continuance, prove alike destructive to it's own powers and those of the body; sometimes producing instant death, more frequently wasting the system by tedious illness. Sleep, also, which we need to recruit our exhausted powers, by it's excess or defect, may injure both mind and body.

62. Many excretions are always going on in the most healthy state of the body. These produce disease if they be retained, or if they be increased beyond the just measure; or, in fine, if, when intended by nature to be retained, they be evacuated spontaneously, or by accident or design. From these observations too, (61. 62.) it will be readily understood, that the most serious danger may frequently arise from the inefficient or immoderate use of remedies. For these either preternaturally excite the various functions proper and necessary to the body; or allay and repress them; and the result frequently is—to diminish the secretions and excretions; to increase them beyond bounds; or, in a word, to effect new excretions and evacuations of humours, which nature never intended in the state of health, and which she cannot bear without injury.

63. As the solids, by becoming flaccid and soft, or by being almost dissolved, are sometimes unfitted for their proper functions, so the fluids are not unfrequently thickened, and formed into solid masses, sometimes of great hardness; whence proceed obstructions of organical action, acute pain, and various and severe diseases.

64. Lastly, among the causes of disease are to be classed certain species of vermin, which support their own life at the expence of others. The lord of animals himself becomes the prey and the abode of vermin of this description, which either attack him externally, or lodging within, corrode the viscera of the still living body. The injury which these do to the patient is often very great, so as frequently to be attended with danger, and even with loss of life.

65. But neither is man without defence against the many and great dangers to which he is exposed, nor is he left hopeless on the first attack of illness. The body possesses a power truly admirable for it's protection against disease. This inherent power frequently prevents diseases; in many circumstances carries off, in the best and speediest manner possible, those already formed; and, in a way peculiar to itself, conducts others by a slower process, to a happy termination.

66. This is termed the *autocrateia*, or *vis medicatrix naturae*, a principle well known to medical men and philosophers, and much and deservedly celebrated. This alone suffices for the cure of many diseases, and it's beneficial influence is felt in almost all. Medicines too, of the best qualities, are efficacious only in so far as they excite, direct, and govern the inherent powers of this principle. For medicine is of no benefit to a dead body, nor can it have any good effect in opposition to nature. Here there is evidently an analogy, and something in common between the salutary virtues of remedies, and the noxious powers of the causes of disease, of which we have already treated (47).

67. By these powers of nature wounds are healed, haemorrhagies are stopped, fractured bones unite, and many noxious substances are thrown out of the body. Thus disorders, which no art could reach, often vanish spontaneously without external assistance.

68. Practitioners, therefore, very properly trust to this power, and endeavour to excite it when languid; or when it has entirely failed, to imitate its usual actions by artificial means. They must not however trust to it

alone, for in some diseases it's influence is not felt at all; while in others, it operates with such violence, that it is more to be dreaded than the disease itself.

69. Diseases of a slighter description may be safely left to the powers of nature alone, but no judicious person would trust to them for the cure of the dropsy, the *lues venerea*, or inflammation of any of the viscera: because, in the former case, they are extinguished; in the latter, they act with the utmost violence, but in a manner unprofitable, and extremely dangerous, tending to produce gangrene, or suppuration, a result nearly equally destructive.

70. It is necessary therefore to guard against a twofold mistake; neither to despise the powers of nature, nor superstitiously to confide in them. For, so far is it from being proper always to tread in her steps, that it is often necessary to take a quite contrary direction, and to oppose her efforts with all our power.

71. Nature herself shews that the physician's office is not confined within so narrow limits; for she furnishes, with a prodigal hand, innumerable remedies, which operate with the greatest force on the human body, and accomplish various and salutary changes in it. In this manner, numerous causes of disease may, by a skilful practitioner, be converted into the most powerful auxiliaries, seeing whatever powerfully affects the body, may at one time kill, at another cure. (53. 62).

72. It is the business of the physician, after having ascertained the nature and cause of the disease, to judge what change is requisite to produce a cure. Medicine, on this plan, is termed rational or *dogmatic*. There is another method of practice, namely, the *Empiric*, which, disdaining a tedious course, professes to search out and bring forward such remedies only as possess a certain and specific power of eradicating certain diseases.

73. Every quack boasts of such remedies, every old woman believes that she possesses them; and the multitude, who would rather be deceived than informed,

always trust to them ; and even after the loss both of health and money, they will hardly part with so agreeable a delusion ; a delusion which they do not wish to be dissipated, so soothing and sweet is hope to every one in his own case. The most experienced practitioners, indeed, acknowledge and regret the small number of remedies of that description hitherto discovered. But it need be no surprise at all, that there are certain remedies found which operate on the human body with a power not yet explained or understood ; as there are likewise so many diseases whose nature and causes are entirely unknown. Meantime, as medical science advances towards perfection, the virtues of medicines, the manner in which they affect the body, and how they prove beneficial in various diseases, will be better understood.

74. Remedies, therefore, are usually classed according to the manifest effects which they produce on the human body.—They affect either the solids or the fluids. The former they nourish or consume, invigorate or relax, excite or depress ; the latter, when vitiated in quantity or quality, they correct and evacuate ; and that either by the natural channels, or by others unusual and artificial. Nor are we unprovided with medicines which may be employed as auxiliaries against concretions formed within the body, or vermin lodging in it (63. 64). That department of science which treats of the effects of medicines, and of the manner in which they act upon the body, is denominated *Therapeia.*

CHAP. II.

Of the solid matter of which the bodies of animals are composed, and its various properties, both chemical and mechanical: of the conjectures concerning its ultimate and most minute structure; of the cellular substance; and also of the origin, nature, and use of fat.

75. The human body consists of solid and fluid parts, by the mutual action of which, the functions of the living man, so far as they are corporeal, are performed. Both are constantly undergoing a process of change and renovation; but the solids more slowly than the other: with the former, therefore, we must begin, as being those which give shape and firmness to the whole body.

76. The solid matter, of which the bodies of animals consist, we call, for the sake of brevity, *animal solid.* Now, this possesses various properties, *chemical, mechanical,* and *vital,* each of which deserves the attention of the physician.

77. The improved *chemical* research of this age has detected different *substances,* or *principles* as they are called, in the various solid parts of the human body; and taught us to exhibit those substances separately. In the first place, it has discovered a great deal of earth, chiefly in the bones: namely, lime, not pure indeed, but combined with certain acids, especially the *phosphoric.* This *phosphate* of *lime,* with a very little *carbonate* of *lime,* gives the bones their firmness; and, with *cartilage,* a large proportion of *gelatine* and *thick oil,* forms nearly the whole of the bones. The *cellular substance* also, the skin, and other membranes formed of that substance, and, in short, the muscles, contain a large quantity of *gelatine,* and a small proportion of

earth. Of these, however, a principal component part is another animal substance, called *fibrine*. *Albumen* has likewise been evidently detected in considerable quantity in certain solid parts of the body, especially in the *cartilages*, *tendons*, and *ligaments*. Besides these, much *thick oil* is found in almost all animal solids; certain *salts*, both *acid* and *alkaline*; and sometimes, as it appears, certain other substances of inferior moment, but much more sparingly. But there is not yet sufficient evidence concerning these; which are neither found in all cases, nor in any one in such quantity as to render the examination of them easy.

78. The solid parts of the human body being subjected to a more accurate *chemical* examination, are easily resolved into a few elements, either by putrefaction, which they spontaneously undergo in a moderate heat, with the admission of air and moisture, or by such a strong heat as destroys the primary combinations of the elements, and forms new ones: the harder being reduced to *lime* and *phosphorus*; and the softer into *carbon*, *nitrogen*, (or *azote*), *hydrogen*, and *oxygen*: which are therefore believed to be the most simple elements of the animal solid; if, in strict *chemical* language, any thing can properly be denominated simple. But these elements, being in different ways separated and combined, either by fire or by putrefaction, form, in the meantime, new substances; such as *ammonia*, *carbonic acid*, *empyreumatic oil*, and many fetid vapours, which cannot be detected in the recent and entire animal solid, but are easily, and almost always observed during its resolution into its elements.

79. The *mechanical* properties, by which *animal solid* is adapted to the purposes of life, are three; a considerable power of adhesion, a certain flexible softness, and a great elasticity. The greater part of the functions of life consist in various motions, and many of them require these motions to be very vigorous. There is a necessity, therefore, for such an adhesion of the parts, as that these may be effected without danger of laceration: for the same reason, it is also requisite that

the solid parts admit more or less of flexion : in fine, it is necessary, that the parts so inflected or displaced, should spontaneously recover their former figure and position, as soon as the power that displaced them is withdrawn.

80. These properties vary much, not only in the several parts, but also in the same parts in different persons, and often in the same person at different periods. Such varieties, though discernible enough, often make little impression on the health. Yet sometimes they invade it, and form evident, and not inconsiderable diseases.

81. In respect of it's *mechanical* properties, every solid part admits of change or disorder in one of two ways, viz. by excess or defect of adhesion, flexibility, or elasticity. When the adhesion or firmness of any solid part is increased, it's elasticity is, for the most part, increased ; and it's flexibility of necessity diminished : but when the adhesion is lessened, the flexibility is increased, and the elasticity in it's turn diminished.

82. There are, doubtless, many different causes of these affections, yet they may be reduced to certain heads. Either the *chemical* composition of the materials is itself disordered, or, while the composition remains wholly uninjured, the particles are so arranged, that their mutual attraction is increased or weakened. As to it's *chemical* composition, it is possible that all the elements (77. 78.) may enter the *animal solid*, in various proportions, and every one, by it's excess or deficiency, produce a disorder peculiar to itself. But we have no certain knowledge of many of these ; only this much is evident, that the humid matter, which is water, and the dry, which consists of several elements, vary considerably : that the greater the humidity, the less will be the adhesion or elasticity, but the flexibility will be increased ; while the very opposite takes place if the dry matter be in excess in the composition.

83. There are various remote causes (37, &c.) of excess or defect in either of these classes of matter. Particularly, the original constitution of the body, contributes

much to it. Some persons rather than others, and in general males rather than females, have the system harder and drier, scarcely, if at all, susceptible of a thorough change by any mode of living.

84. Age, however, produces a still greater difference; for, from first to last, the body is daily becoming drier and harder: from the fluid and crude fetus to the rigid and sapless old man, whom, from this very circumstance, life is ready to desert.

85. Farther, the food which we use, according as it is more or less watery, produces a similar condition of the solid parts. This has been long ago observed in other animals, and seems to take place in man also, at least to a certain extent. And there are weighty grounds for believing, that not merely the condition and powers of the body, but the disposition of the mind likewise, is in some measure affected by the nature of the food.

86. Much depends too on the good or bad digestion of the same food, and apposition of the nourishment furnished by it.

87. In fine, the atmosphere, by it's moisture or dryness, affects the system in a considerable degree: hence those who inhabit mountainous or dry countries, differ much from the inhabitants of moist and marshy places.

88. Lastly, the mode of living contributes somewhat to the same effect: bodily exercise promotes the discharge and exhalation of its superfluous moisture; indolence has a quite opposite effect, and renders it's humidity more abundant.

89. But, though the *chemical* composition of the solid parts be not altered, the state of these may be much affected by other causes. For the increased density of the particles, whether arising from *mechanical* causes, or from heat and cold, will produce various degrees of firmness and elasticity.

90. The effect of *mechanical* compression is clearly manifested from the experiments of the celebrated *Clifton Wintringham*. The distention also of *animal solid* considerably affects those properties already mention-

ed. The more it is stretched, it becomes the harder, firmer, and more elastic, and admits of increased extension, with increasing difficulty; till, at last, impatient of farther distension, on the application of a new power, it gives way, and is ruptured, the adhesion of the particles being overcome where it had been weakest. Hence, in some degree at least, (not exclusively, for much depends on the vital principle, and original structure of the body), is to be deduced the cause of many circumstances of the greatest moment; of the increment of the body, it's acme, it's decay, it's daily increasing firmness, and of inevitable death by old age.

91. It is possible, that a variety of density in the solid parts, is derived from nature itself: but the efficacy of exercise or indolence, in changing their state, is better established; the general effects of these on the solid parts, whether good or bad, will be easily understood.

92. Farther, by protracted rest, any part, naturally moveable, as the articulation of a limb, gradually becomes rigid, and recovers it's original mobility slowly, perhaps never completely. On the contrary, by vigorous and frequent use, provided it be not excessive, almost all parts of the body often acquire surprising mobility. Nor indeed can a better or more certain remedy be applied to overcome that rigidity of the joints, which is induced by long continued rest, than frequent exercise, which, though very difficult at first, and for a long while but sparing, generally becomes more easy, free, and perfect every day.

93. Heat relaxes and expands all bodies: but cold renders them dense and hard: man usually has distinct experience of both effects. Although the body, for the most part, preserves it's heat nearly the same, it's surface, at least, cannot always escape being affected by the surrounding atmosphere: nor is it a slight influence which heat exercises in this manner over the whole body. How differently does the man feel who, become dull and languid under the hot southern blast, with difficulty drags his limbs along,—from him, who, under

the cold northern breeze, exercises himself on the frozen lake, braced, agile, and light in every limb.

94. The experience of every day, the effects of the warm bath, and the experiments made by *Bryan Robinson*, unite to evince the increased effect on the properties of *animal solid*, from the combined operation of several of those causes which, in so many ways, affect it separately.

95. Of this matter, the various parts of the body, adapted to their several offices, are formed. It is not yet clearly ascertained what is the ultimate and most minute structure of the *animal solid:* whether, as *Boerhaave* teaches, it consists of fibres rather long than broad, variously interwoven; whether of serpentine fibres admirably twisted, as certain late observations seem to indicate; or whether the *cellular substance* be fabricated of fibres and laminae; and the greatest portion of all the parts of the body be fabricated of this, as the celebrated *Haller* has attempted to shew.

96. Fibres and their properties will be treated of in their own place (109, &c). The *cellular substance* is observed in every part of the body; it envelopes and connects the fibres themselves, which appear sufficiently distinct in many parts, and slightly unites various parts which ought to have some motion on those contiguous to them. The same, in a condensed state, forms the firmest and the finest membranes. The simplest of these, to appearance, when subjected to more accurate examination, shew this structure.

97. The *cellular substance*, and the parts formed from it, membranes, vessels, &c. are often enlarged in a surprising manner, especially when slowly distended: but sudden distention either breaks it, or renders it thinner. Sometimes also it grows between contiguous parts, and unites those which nature had left free. Such preternatural concretions are often observed after inflammation of the lungs, or of the abdominal viscera. And these new membranes are truly *cellular*.

98. Also, if cut or otherwise separated, it spontaneously grows together. But if, by extended inflamma-

tion, followed by suppuration, a large portion of the *cellular substance* be destroyed, in that case it is not renewed, and an unsightly scar is left in it's place.

99. Farther, a part either of the same, or, as is alledged, of another body, may sometimes, by a concretion of this kind, be united to another part. On this foundation, if on any, rests the art of *Taliacotius*, as also other experiments, greatly extolled of late, of transplanting teeth.

100. In some parts the *cellular substance* is formed into a net-work; in others, it is replenished with fat. Wherever a large mass or compression would have been attended with danger or inconvenience, as in the head, the lungs, the eyes, the eye-lids, the penis, the scrotum, &c. there it collects no fat, but is lax and purely retiform. But, between the muscles of the body and of the limbs, under the skin, and in the abdomen, especially in the omentum, and about the kidneys, fat is secreted and collected in great abundance.

101. Fat is a pure animal oil, differing little from the expressed and mild oils of plants; fluid during life, but thicker or thinner in different parts. It is secreted from the blood, into which it is readily, and often suddenly reabsorbed, though it is very seldom seen in the blood in the state of pure oil or fat.

102. It is probable, that by digestion, partly in the stomach and intestines, partly in the lungs, oil is converted into *fibrine*, *gelatine*, and *albumen*; and that, by secretion, these are again converted into oil. In fact, no organs are shown for the secretion of fat: yet there must be such, as also a peculiar fabric of the *cellular substance* of those parts which ought to contain fat, that it may retain the oil when secreted, and not permit it to pass to others. For it never finds it's way into the parts purely retiform, though the *cellular membrane* affords an easy passage to air or water, over the whole body from head to foot.

103. In the foetus, when young, there is no fat; when mature, it contains a small portion: but infants, when well nursed, commonly acquire more fat until

they begin to walk, and exercise their own strength: then they become slender, and remain so till they arrive at manhood, when their exercise is commonly not so frequent or violent. At this period, the body assumes a square and often very corpulent form. In mature old age, they are gradually emaciated again. Girls, however, have some tendency to corpulency about the age of puberty; whence their elegant, smooth, rounded shape, so lovely, and alluring; and in general, at all periods of life, females are more inclined to corpulency than men. And men, whose habit of body is lax and flaccid, are more corpulent than those of firmer texture.

104. Fat is accumulated by the use of much food of an oily nutritious quality, especially of animal food, (if the digestion be good,) and of strong drink, particularly ale; it is promoted by quiet and tranquillity of body and mind, by indulgence in sleep, by torpor, by emasculation, by cold, by repeated venesection, and by many other evacuations; by every thing, in short, which, without destroying health, weakens the vital and animal powers, and diminishes the usual secretions. But much depends on the habit of the body itself, for man cannot, as an ox, be fattened at pleasure.

105. A certain degree of corpulency, corresponding to a person's age, is a sign and effect of perfect health: but when it is in excess, it is both a disease in itself, and the cause of others. It may, however, at all times be effectually reduced by severe bodily exercise, little sleep, and a dry and spare diet, provided one set about it in earnest, and with sufficient resolution. It is a rare thing to find a common soldier complaining of this disease.

106. A considerable part of the body, sometimes the most considerable, consists of fat. It cannot therefore be doubted that it has its proper uses. Serving the purpose of oil to the moveable parts, it diminishes their friction, and renders their motion more free and easy. Thus, it preserves the solid parts from the abrasion that would otherwise take place, and contiguous parts from

growing together, a circumstance which sometimes happens, when, by ulcer, or other accident, any part of the membrane which contains the fat has been destroyed.

107. Farther, it contributes not a little to the shape and beauty of the body, filling up great interstices between the muscles, which would render the body deformed and unsightly; while by the just proportion of fat, it becomes sleek, smooth, and round. Besides, fat gives the fair, waxen colour, which, mixed with the ruddy, produces the most comely complexion. Whence it happens that young women, fearful of becoming too plump, and endeavouring to reduce themselves by medicines, regimen, or mode of living, when they get quit of their sleek habit of body, commonly lose their beauty too.

108. Fat is believed to nourish the body when reabsorbed from its cells into the blood; but this is uncertain. It defends, in some measure, from cold; hence it is bestowed in great abundance on the animals of the frigid climates.

CHAP. III.

Of the living solid or nervous system, it's properties, structure, and uses; and also of the conjectures which have been advanced concerning it's nature and functions.

109. THE *living* or *vital solids* denote those solid parts which are endued with sensation and motion. These properties, depending on life, begin and terminate with it: but those properties of the solids, of which we have already treated, (75, &c.) remain even after death.

110. The parts endued with sensation or mobility, or both, are the brain, the cerebellum, the *medulla oblongata*, and spinal marrow; the nerves arising from these, dispersed in general over all the body, bestowed on all the various organs of sense, and on the muscles; and lastly, the muscles themselves.

111. Sensation is much more general than mobility, the former being common to all the parts now mentioned, though it evidently takes place solely by means of the nerves. But mobility is peculiar to the muscular fibres alone; therefore, wherever sensation is, there also are nerves; and wherever mobility is observed, in that part there seem to be muscular fibres.

112. Farther, mobility seems to depend on the connexion of the muscles with the nerves, &c.; for when a nerve is cut, compressed, or tied, the muscles on which it is distributed, in a short time lose their mobility or proper contractile power; and the result is the same, if the brain itself, or the origin of the nerves, be disordered.

113. Some believe that muscles derive their origin and formation from nerves, and consist of the same material. The structure of both is alike, so far as both

are composed of very minute fibres; both are white, provided the muscles are well washed and cleansed from the blood which they contain in abundance: and, not even by the assistance of a *microscope*, can the nervous fibres, which enter the muscles in great numbers, be at all distinguished from the muscular fibres themselves. Farther, the same feeling is common to both, and stimulating and sedative medicines produce precisely the same effect on muscles, whether applied to the muscle itself, or to the nerve which is distributed on it.

114. We will have an opportunity elsewhere of adverting to the great difficulties which obstruct the knowledge of the origin of many parts of the body; whether we suppose that they have all been produced at the same time, or in a certain order, and in succession. In the meantime, it must not be dissembled, that certain muscular parts are observed very early in the fetus, and have already acquired considerable strength and vigour, while the brain itself is found as yet soft and almost fluid; and that the action of the former is requisite to the function and enlargement of the latter; the muscles also are always much firmer than parts purely nervous, and have a power, that of irritability, peculiar to themselves, in which the nerves never participate.

115. In order, then, to produce powers so dissimilar, it must be admitted, either that muscles are composed of matter very different from that of which nerves are formed: or if both consist of the same, that it's structure is entirely diversified. But, again, if the substance of the muscles and nerves be different, it will be evident that much of the nervous is intermixed with the muscular substance. For the finest needle cannot be inserted into a muscle without at once puncturing or lacerating many small branches of nerves, as the pain plainly shews. (111.)

116. So close, then, is the connexion subsisting between the muscles and nerves, both in reference to office and structure, that all the living solids are justly accounted of the same kind, and usually receive from medical men the name of the *Nervous System*.

117. The admirable properties which these parts possess, give them the most powerful claims on the attention of physicians and philosophers; and many very ingenious men (among whom we must number the great *Newton,)* have bestowed much pains in investigating their causes, and the manner in which their functions are performed; and have published the various conjectures which they severally adopted on these subjects. But no rational plan has yet been proposed for ascertaining the matter by experiment: and the experience of two thousand years has afforded evidence, more than sufficient, how very seldom it happens, that even the wisest of men can discover the arcana of nature by conjecture. Some writers have very grossly abused the ever venerable name of *Newton*, by referring wholly to his authority the opinion which they wish to defend: although with his accustomed modesty and prudence (which most authors are more disposed to praise than to imitate) he proposed his ideas on this subject only as a conjecture or question to be refuted or established by suitable experiments and arguments. But it is not permitted to adopt as truths the conjectures even of a *Newton*. This were neither to imitate him nor to promote science.

118. Various indeed have been the opinions advanced concerning the manner in which sensation and motion are produced in the animal system; but all have this common foundation, and perhaps defect, that they seek the explanation in certain motions appropriate and peculiar to the *nervous system*, which, in the case of sensation, commence at the organ of sense, and are propagated along the nerves to the brain; and, in the case of voluntary muscular motion, commencing at the brain, are conveyed to muscles along nerves—either the same which serve the purpose of sensation, or others entirely different and distinct, though bound up with them in the same bundle.

119. Some suppose these motions take place by means of a tremor, or *vibration*, as they term it, of the very

substance of the nerves, just as the strings of a lyre vibrate when struck with the plectrum.

120. Some, who were fully convinced that the brain and nerves, being wholly of a very soft texture, and easily impeded by contact of the contiguous parts, to which they are also frequently tied, are very ill adapted for performing and propagating such tremors or motions,—yet pleading for the existence and necessity of these motions, ascribe them to a subtile and very active fluid, which they pretend exists in the nerves, moving according to peculiar laws, and possessing many surprising properties and excellencies.

121. In fine, others have chosen rather to take refuge in a *Universal Ether*, such as philosophers, both ancient and modern, have supposed to pervade and fill the whole universe; by the assistance and attendance of which, the stars have been supposed to move, the sun to shine, the sea to ebb and flow, the rivers to glide, the winds to blow, the plants to spring, and Jupiter himself to thunder. To this ether, extremely useful and active to be sure, but nowhere tangible, nowhere brought to the test of experiment, more mutable and fleeting, than Proteus himself,—to this ether, so long and so violently agitated, and all to no purpose, it is high time to bid farewell, that it may, for the future, rest in peace. For what hope of catching that

Cui—" *in plures jus est transire figuras :*
" *Nam modo te juvenem, modo te videre leonem,*
" *Nunc violentus aper ; nunc quem tetigisse timerent*
" *Anguis eras : modo te faciebant cornua taurum :*
" *Saepe lapis poteras, arbor quoque saepe videri :*
" *Interdum, faciem liquidarum imitatus aquarum,*
" *Flumen eras : interdum, undis contrarius ignis.*"

122. It was a gross mistake, indeed, in medical men to dispute about these or like theories; before the existence of such ether, and of such motions in the *nervous system*, had been established by observation or experiment; while as yet it was not even rendered pro-

bable, that the difficulty would be solved by these conjectures. For, granting all that is demanded concerning the ether, and the motions in the *nervous system*, very little is gained; because whatever tremors of nerves, or motions of the ether, the keenest advocates of these theories can imagine to themselves, they are in no respect sensation, neither do they resemble it, nor are they ever convertible into sensation, according to any known laws of nature.

123. It will not be an easy task to shew by what means the volition of the mind, which contains in itself nothing corporeal, should affect and set in motion the finest, the most subtile, and active ether, any more than a mass of stone.

124. Nor, on this supposition, is the account more clear or satisfactory which is given of the internal senses, memory, imagination, and judgment. It will scarcely be believed, that any motions in the *nervous system* are retained and treasured up, to break out anew, and be renewed at our pleasure; or, that any impressions, traces, or images of those motions, are made on the brain, as of a seal on wax, so that we may at pleasure contemplate them again and again, or repeat anew the motions which produced them at first: yet, in the exercise of memory, or imagination, and in dreaming, there is frequently a very powerful renovation of past sensations.

125. Farther, if such motions are equally necessary to the action of the internal and external senses, then it must be admitted, either that the motions precede the sensation, or that it precedes them, or, finally, that both take place at one and the same instant of time. If the sensation precede, it cannot arise from any motion of the nervous fluid, and another cause must be assigned. If these motions precede sensation, *their* cause is also to be sought for, seeing they cannot depend on the sensation or volition that follows them. If, in fine, both motion and sensation are simultaneous, some distinct cause must be invented for both; for neither of the two could be the cause of the other previous to it's own existence.

126. It is difficult indeed, if not impossible, for our minds to conceive that any change takes place in corporeal substances, which has no dependence on some motion, or which is not at least, conjoined with it. But the matters treated of here, viz. sensation both external and internal, volition, and, in short, efforts to move the muscles or limbs, are neither corporeal things, nor to be explained on the principles which are applicable to these.

127. Laying aside, then, such suppositions, (on a subject which nature has, perhaps, withheld from human view,) as leading to consequences useless, incomprehensible, or even absurd: it will be more to their own advantage if medical men apply themselves vigorously to investigate the particular facts and truths connected with this subject.

CHAP. IV.

Of sensation in general, it's varieties, uses, pleasures, pains, and disorders.

128. SENSATION requires no definition, nor, indeed, does it easily admit of any; as, in general, nothing can be more simple or better understood. It is, however, usually described, we can hardly say explained, by the following tedious, inaccurate, and indeed, trifling circumlocution;—a change in the state of the mind, of which we are conscious, produced by some change in the state of the body.

129. But however simple sensation may seem at first view, philosophers, on a more accurate examination of the matter, believe that they have discovered it to be twofold, and, therefore, advise to distinguish carefully between two things pertaining to sensation, which, by the vulgar, are usually comprehended under one and the same name; though, in fact, there exists no man of sound intellect so stupid as to confound these things: and philosophers have been too rash in charging the bulk of men with such a mistake.

130. The first of these things, namely, the change produced in the state of the mind, relates to the mind alone, is peculiar to it, in it's nature fleeting and perishing, at the same time most simple, incapable of definition or description, entirely dissimilar to the object which excites the sensation, in nature and circumstances extremely different from every thing corporeal, so that neither itself, nor any thing similar to it, can exist in the external object which we perceive.

131. But the other thing usually comprehended under the name of sensation, namely, some quality of the

external object which we contemplate, which the sensation (the change in the state of mind) represents or suggests to us, appears to be of a very different nature. For the qualities of external objects, which we perceive by means of sensation, pertain to those things alone, they cannot, by any means, exist in the mind; nor have they any thing similar to it, or in common with it or it's various states; in their own nature they are constant and durable, whether perceived by us, or unknown and neglected; nor are they so simple, but that many of them, at least, may be defined or described, and mutually compared, with ease and accuracy.

132. In fact, we acquire the greatest and most useful part of our knowledge of external objects, in a very easy and simple manner, through various senses, especially sight and touch, without any study or toil; so that it is very evident, that with this design, in part at least, these sentient powers have been bestowed on us by the Supreme Author of our frame. But all the senses do not serve this purpose, nor is the path so easy and plain to the knowledge of the whole of Nature; and, indeed, many things shew that the various senses with which we are furnished, often serve other important purposes.

133. Sensation takes place in a man in health and awake, whenever the state of any part of the nervous system is somewhat changed, whether that change arise from an external or internal cause. Sensations arising from the former cause, are, by medical men, said to take place by impression or impulse, those from the latter, by consciousness.

134. Yet sensation does not attend every impulse applied to the *nervous system.* In order to this effect, the impulse must be made with a certain force or impetus on the sentient part. From a slighter impulse, the feeling is either obscure, or quite imperceptible; from a much more violent impulse, there arises pain, with no distinct perception; and, in short, if the impulse be extremely violent, and such force applied to the sentient part as to destroy the structure of the organ itself, then a stupor is commonly produced.

135. That impulse or impression too, which is very transitory, though otherwise of sufficient force, does not produce a distinct sensation; to this is evidently required some duration or continuance of the impression, as appears from the fact, that bodies, even of considerable size, may be moved with such velocity, that they cannot be noticed. The same principle accounts for many of the feats exhibited by jugglers—a class of people with whom it is an *axiom*, and one which lies at the foundation of their whole art, that motion is much quicker than vision.

136. When the impulse however has ceased, and thus, of course, the external cause is withdrawn, the sensation excited by it, commonly endures for some space of time, however small. This is evident from the circle of flame which we observe in the rapid rotation of a burning stick.

137. Again, sensation is not so completely corporeal as to exclude it's dependence, in no small degree, on the state of the mind; for, when this is otherwise engaged, impulses sufficiently powerful, applied to the organs of sense, are scarcely, or not at all perceived. On the contrary, by due attention we often distinguish with ease the slightest impulses, while more forcible ones are neglected, or scarcely perceived.

138. It would seem, that on this foundation, at least in a great measure, rests that astonishing and almost incredible acumen and perfection of the several external senses, which people engaged in various employments, acquire by practice; though it is probable enough that somewhat of this perfection is to be attributed to the condition of the organs, which in various ways may, by frequent exercise, be rendered more acute, and better adapted to their functions. It is well known that the organs of motion are much improved by this means.

139. Attention depends in some degree on the will: yet it is commonly given to those feelings which are powerful, or new; pleasant, or unpleasant; and, in short, to those which affect or disturb the mind in any way uncommon.

140. Hence, so many things are either slightly perceived, or not at all, notwithstanding their having made sufficient impression on the organs of sense; or though perceived in some degree, it has been very inaccurately, and they are instantly forgotten. Hence, other circircumstances being equal, new objects are most noticed, and new sensations are the strongest. Hence, even powerful sensations, when often repeated, become in a short time familiar, and are almost neglected: while impulses of a more feeble character, which yet had been usually attended with sensation sufficiently distinct, being often repeated, are not perceived at all, and leave no traces of them in the mind.

141. Some strenuously contend, that during sensation, a person always contemplates only one sensation or perception of an external object; but that he passes and repasses, with such ease and celerity, and in some measure at pleasure, from one sensation to another, that, at first glance, he seems to himself to comprehend many at once. This, however, is rather uncertain.

142. But it is very certain that man often attends to several sensations at the same time, when they are of the same kind, and can be so combined, and as it were mixed, as to constitute one perception differing from the particulars, and compounded of them. This union may take place, either by several impulses made at the same time, or by new ones succeeding others so suddenly, that the posterior sensation had already commenced ere the preceding one had terminated. For the feeling often remains longer than the impulse itself, especially if due attention be employed. (136, 137.) This is proved by the musical combination of sounds; by paper stained with various colours, which, when rapidly moved in a circle, exhibits the same mean or mixed colour, compounded of the others, as would arise from the actual mixture of those colours.—Smells, likewise, and tastes, in their several departments, are capable of being formed into similar compounds; of which some are grateful, others are found unpleasant. On this, in a great measure, are founded the arts of the cook, and

of the perfumer. But the perceptions or sensations which are furnished by the sense of touch, are so many, and so different, that they scarcely admit of being combined, so as to form one mediate or compound feeling.

143. When, from any external cause, an impulse of sufficient force is made on an organ of sense, and continues a certain time, the sensation will vary on account of the many internal circumstances proper to the sentient body, and the many parts requisite to sensation. In the first place, allowance must be made for the state of the mind, in respect of attention; then, for the brain, in regard to delirium, or torpor, sleep, or watchfulness, &c.; also for that of the nerves which communicate with the sentient organ, according as they are entire, free, or sound; or as they are compressed or otherwise injured; also for the state of the extremities of the nerves of the organ itself, whether of greater or less sensibility, arising either from the original constitution of the body, from former impulses made on them, from heat or cold, or from the state of the blood vessels, which inseparably accompany the minute nervous fibres, and which may either be unusually relaxed or distended, or even inflamed; in fine, we must take into account the state of the parts, whatever they are, which cover and defend the very fine and keenly sensible extremities of the nerves, and increase or temper the force of the impressions. Such is the cuticle on every part of the body, the external and internal ear, and both auditory passages, and lastly, the various humours of the eye.

144. Farther, some sensations arise from many internal causes, without the assistance or concurrence of any thing external. Even the mind, conscious of itself, and it's various states, thought, memory, imagination, will, and all the affections may be referred to this class of causes.—So also may the various states of the body, it's vigour, debility, alacrity, torpor, lassitude, pain, anxiety, itching, the appetites, as hunger and thirst, in a word, many propensities, such as incline us to coughing, vomiting, the alvine discharge, and the like. But

we are accustomed to refer the most of these sensations, so far as the body is concerned, to the sense of touch.

145. Sensations, whether external or internal, have never been accurately referred to classes or genera. The external, however, have universally been reduced to five genera, sight, hearing, smelling, taste, and touch. As to the first four, the few qualities of external objects perceived by them, are reduced with ease into classes differing among themselves, and referred to one and their own proper sense: chiefly because that sense has it's own singular and peculiar organ, and, neither has a seat, nor can by any means be excited, in any other part of the body: also, because an organ of sense is affected by one kind of impulse only, of light, for instance, of tremors of the air, or of volatile particles; in fine, because the perceptions from each of these senses, however seeming to differ among themselves, have always something in common, so that they can be compared, and their resemblances and differences detected.

146. This holds most true of those things which are perceived by the ear, nose, or tongue. But the eyes take in a greater variety of objects, and those widely dissimilar, as colour, figure, magnitude, and motion. All these perceptions, however, are easily referred to one sense, because they are perceived by the same organ, and the same medium, as we say, and by the same kind of impulse. But the remaining perceptions, however dissimilar, are referred to the sense of touch.

147. The greater part of sensations are found to be either agreeable or disagreeable: in as much as they not only give us notice of external objects, and exhibit their qualities to us, but at the same time affect the mind in such a manner, that the continuation, or repetition of the same sensations, becomes the object either of our desire or aversion.

148. In certain instances of sensation, the feeling itself (or change affected in the state of the mind) is pleasant, and the enjoyment springs from it alone; but in other instances, the enjoyment arises not so much

from the feeling, as from the perception, the quality or condition of the external object, which, by means of the sensation, we come to perceive and know.

149. To the former of these classes belong the agreeable feelings or pleasures which are furnished by our taste, smelling, or hearing; to which must be added certain feelings, as of warmth for instance, which are conveyed by the touch. For, in these cases, the mind attends solely to the sensation, from which we learn nothing definite concerning it's cause, or the quality of the external object that excites it. If we have any such knowledge, we have acquired it entirely by means of the other senses and judgment, by observation, experiment, or reasoning.

150. To the latter belong certain pleasing perceptions, suggested by the sight or touch, of the qualities of external objects; as of all kinds of visible beauty, shape, proportion, motion, and perhaps colour too; or in fine, of tangible shape, smoothness, or softness. For, in these instances, it is the perception itself that pleases; and, neglecting the sensation or change in the state of the mind, we instantly make a transition to the object or quality which that sensation suggests, and often contemplate it with pleasure.

151. It seems truly difficult to account for so many different sensations arising from the various kinds of impressions made on certain organs of the body. (145, 146.) But it is much more difficult to explain why almost every kind of impression on the various organs, excites such sensations, as not only represent it's own peculiar perception (130, 131.) to the mind, but at the same time either afford it enjoyment, or affect it with severe pain, anguish, uneasiness, or aversion.

152. For sensations, however differing among themselves, according to the various organs, or the objects that affect these, are, nevertheless, severally uniform, and always referable to the same causes. And we have no evidence, either that the same impression produces a different sensation or perception in the same person at different times; or that the same object or impression

produces a different sensation or perception in different persons, unless in some very rare instances, in which it is probable that there existed in the body some defect, and that not a trifling one; or, at least, that the organs of sense were much perverted from their ordinary and natural state.

153. The pleasure, however, uneasiness or aversion, which accompany so many sensations, vary exceedingly, both in different persons, and in the same persons, at different times.

154. Custom also exercises a striking and almost incredible influence over the pleasures and pains of sensation; but very little over the sensation itself; and none at all over the perception of the quality of the external object which the sensation suggests. For no person in sound health, can by nature, or by any custom, be made to perceive hard instead of soft, red instead of green, honey instead of wormwood, or wormwood instead of honey; although, by a particular constitution, or, in a word, by frequent use alone, that very bitter herb may become more grateful and pleasing to his taste than the honey of Hymettus.

155. Although the greater part of our sensations are more or less agreeable, it must not be denied, that in this respect there exists a striking difference among them; that by nature some of them are almost universally very agreeable, others very disagreeable; and some, in short, so indifferent, that they give neither pleasure nor pain. Such diversities of sensations have not yet been accounted for.

156. It is, however, worth notice, that almost every kind of sensation, without any change of its nature, is either agreeable, or the contrary, according to it's force. For there is no feeling so pleasant but, when preternaturally excited, may become disagreeable, sometimes nearly insupportable. And, on the contrary, those which by nature, and of their usual force, are very offensive, becoming more slight, are often tolerable, and, in some cases, very pleasant.

157. In nearly the same way we may account for the

fact, that many sensations, at first agreeable, cease to give pleasure, when often repeated, though they retain the same nature, and, in respect of the impression itself, the same force; and many, which at first were disagreeable, cease to offend, and at last, become pleasing, though neither their nature, nor the force of the impression, have been changed in the least. The attention of the mind being withdrawn from sensations often repeated and familiarized by custom alone, they are more slowly perceived, (140.) and at last, utterly neglected.

158. In this way too, a reason may be assigned, why new sensations are usually most agreeable; why variety is so pleasing; why we wish our sensations, or at least the impressions made on the organs of any sense, more powerful, that the pleasure may be increased or continued; why we attend little or not at all to so many pleasures, and are generally unconscious of their existence, till we have lost them; why children, in comparison with the aged, have so many, so steady, and unmingled pleasures, and therefore such uninterrupted cheerfulness. For however great the amount of pleasure which one would enjoy who is suddenly endued with a new sentient faculty, or whose lost sight is newly restored; the same amount we have formerly possessed by all our senses, though long use and habit have now nearly extinguished the enjoyment.

159. The greater part of our sensations, when sufficiently powerful to be easily and accurately distinguished, in general are very pleasing, and each in it's own kind and manner: but pleasures are of various kinds, and therefore, different sensations may give pleasure in different ways. In fact, the sun's meridian splendor, or the glowing beauty which then adorns the face of universal nature, are not the only objects that delight the human eye; nor are great concerts the only sounds that charm the ear. Man, with a far different, but with no contemptible enjoyment, gazes on the gloomy sublimity of the temples of the Deity, approaches by moonlight the shady groves, and, even of choice, contem-

plates the dreary darkness of the night: he listens with delight to the zephyr agitating the grove, to the hum of the bee, and to the murmur of the stream. Yea, there is a time when darkness, when silence, when, in a word, the absence of every sensation, alone can please.

160. The pleasures of sense, then, are confined within their own limits, and these not too ample, seeing they can neither be greatly increased, too frequently repeated, nor long protracted or continued: as if Nature herself adopted this plan, to put us in mind that man is not born for pleasure only, at least not for pleasures of this description; for all of them, when too keenly pursued, are broken off by languor and disgust; and some are cut short with severe uneasiness, or even pain. And, truly, as the transition is so easy from pleasure to uneasiness or pain, so in a manner nearly similar, the sudden cessation of pain, especially if violent, is sometimes an incredible pleasure; so much so, that if it could be bought for a lesser pain, or any other price, it certainly would not want purchasers. Pleasure and pain, as stated by *Socrates* in a beautiful fable, were sisters, though very unlike, and experienced different treatment: the one being the object of desire, and acceptable to all, the other no less the object of aversion. These, Jupiter has, nevertheless, associated in such a manner, and united by a bond so indissoluble, that though they are of opposite tempers, and look different ways, whoever embraces the one, will find he possesses the other also.

161. A great difference is, however, observable in this respect between the various sentient powers, and the divers pleasures resulting from them. Some are quickly fatigued, and neither perceive their proper objects distinctly, nor find enjoyment in those which are sufficiently distinguished, and which had been at first very agreeable: others continue for a longer time adequate to their functions, and enjoy more lasting pleasure. Thus, in general, the smelling and taste are quickly satiated; the hearing more slowly: of all the external senses, the sight is the last to feel satiety: but the

pleasures which are solely derived from the mind, or internal senses, are by far the most durable of all. In a word, we may protract considerably all our pleasures by varying and mingling them one with another, and by often interposing things less agreeable with those which had a greater tendency to give delight, so that there may not be too much, even of a good thing.

162. There yet remain some other circumstances different from those already mentioned, which exert considerable influence on some of the pleasures of sense: such are the various conditions either of the whole body, of the nerves especially, or of some particular organs or functions, to which functions, certain organs of sense, and perhaps the senses themselves, are in a great measure subservient. And this is one cause among others, why many pleasures, those especially which are most keenly pursued, cannot be permanent. To the thirsty man, simple water is nectar; the plainest food is relished by the hungry, to him even the smell of it is pleasant; to the individual overheated, or in fever, coolness is delightful, and when chilly, he rejoices in warmth. But to the same persons, in other circumstances, the same objects, so far from affording enjoyment, would have a contrary effect, as food and drink, however delicious, after an entertainment, or the savour of meat immediately after dinner; and, in fact, neither can the most abandoned gormandizer enjoy a perpetual banquet, or a second dinner immediately after the first; nor can Venus herself afford enjoyment at all times to her most strenuous votaries.

163. But again, pleasure and pain may arise from other sensations beside those which are occasioned by external impression; (133. 144.) from the action of the muscles, while it is performed with vigour, ease, and alacrity, and not continued so long as to fatigue, a pleasurable feeling is enjoyed; but the opposite sensations, arising from muscular action, those of dullness, lassitude, difficulty, and debility, are always uneasy: in short, the various states of mind, the affections, the various exertions of memory, imagination, and judgment, are, in

like manner, experienced to be at one time pleasing, at another, painful.

164. Upon the whole, it seems reasonable to conclude, that Nature has provided for man with such benignity and liberality, and furnished him with so many pleasures, that he might not only live, but enjoy the life which she hath given.

165. Nor indeed do the pleasures of sense want their peculiar and important uses. That general suavity which attends almost all our sensations, especially in early years, invites us to exercise thoroughly our various sentient powers, rendering them acute; while, at the same time, we are daily acquiring to ourselves the greatest and most useful portion of our knowledge. (131, 132.)

166. In a similar manner are mankind, especially in childhood, invited to the moderate and frequent use of their organs of motion, the inherent power of which is thus promoted, and the easy and prompt use of them acquired.

167. Farther, we are invited by the recompence of singular pleasure to certain actions of the greatest moment, pertaining either to the propagation of the race, or the preservation of the individual.

168. Lastly, by the pleasure which arises from moderate employment of the mind, we are induced to exercise and cultivate it's noblest faculties, which, when neglected and unemployed, are but slender, but when duly cultivated, become almost divine.

169. In short, the several senses, both external and internal, with which we are furnished, are liable to various disorders; every one of them, especially of the external senses, may be either too acute or too obtuse, destroyed or depraved. To this place also might be referred many uneasy sensations, which, whether they be themselves primary diseases, or only the symptoms of other diseases, have a special claim on the attention of the practitioner. (34.)

CHAP. V.

Of the sense of touch, and it's disorders; of pain, anxiety, and itching.

170. Of all the external senses, that of touch is the simplest, and most general; being common to the whole of the *nervous system.* It is, however, much more acute in certain parts, the skin for example, especially in the points of the fingers. These are said to be furnished with nervous papillae, which, by an influx of blood, are somewhat erected in touch, rendering the feeling more distinct: but this opinion, instead of being established by any decisive observations of the fact, seems rather to rest on a conjecture derived from the structure of the tongue, which is a very delicate organ, not of taste only, but of touch also.

171. By touch we perceive the various qualities of bodies; as hardness and softness; roughness and smoothness; heat and cold; bulk, figure, and distance; pressure and weight. It is seldom fallacious or depraved; for this reason, that the bodies, the qualities of which are to be examined, are very closely applied to the organ itself, without the intervention of any *medium* which, by it's variety or change, might corrupt the sensation, or lead into mistake.

172. As to the disorders of this sense, the instances, if any, have been very rare, in which it has been observed too acute over the whole body. In a particular part it is often too acute, from the cuticle being too thin, too soft, or wanting; or from the part itself being inflamed, or exposed to too much heat.

173. It becomes too obtuse, or is quite destroyed universally, or partially, to a considerable extent, by various disorders of the brain and nerves, by compres-

sion, wound, or deficiency of vital power: this is called *Anaesthesia*, sometimes an attendant of palsy; and sometimes observed in the one side without palsy, while the other side, with the feeling entire, has become paralytic.

174. The defect of this sense in a particular part is owing either to a fault of the nerve, arising from compression, obstruction, wound, &c.; to the part itself being exposed to too much cold; to disorder of the cuticle which covers it, when it has become too thick or hard by handling substances rough or too much heated, a circumstance which often happens in glass and iron works; to the elevation of the subjacent *cutis* by the interposition of blood, serum, or pus; to the skin itself become macerated, relaxed, and torpid, as happens sometimes to dropsical patients; or, in fine, to the corruption of the whole organ, by gangrene, burning, excessive cold, or contusion.

175. Touch is very seldom depraved, unless, perhaps, during delirium, when all the functions of the brain are wonderfully deranged.

176. Pleasure or pain may arise from touch, as well as from the other senses. Smoothness, softness, and moderate warmth, affect us with pleasure. That gentle itching, or titillation which is accounted a pleasure, belongs also to this sense, though it frequently arises from internal causes.

177. To this sense we refer pain, and, in general, other uneasy sensations, anxiety, itching, &c.; although, in fact, pain may arise from every kind of sensation, when highly excited.

178. Pain is an unpleasant, violent, and keen feeling, which we refer to a definite part of the body; with some uncertainty, if the seat of it be internal, but with greater accuracy, if the surface of the body be affected. The cause of pain, however, is not always inherent in the part affected. It arises from the great violence done to the sentient part, whether that violence proceed from within or from without. Whatever, then, punctures, cuts, lacerates, distends, compresses, bruises,

strikes, corrodes, or burns, or in any way violently stimulates or irritates, may create pain.

179. Hence it is connected with so many diseases, as their very frequent and very troublesome attendant; oftimes more insupportable than the disease itself. Moderate pain excites the part affected, and by degrees the whole body, promotes a greater flux of blood and nervous energy to the part, and often stimulates to motions necessary and salutary; proving a faithful, though unpleasant monitor; and, on this account, deserving sometimes to be enumerated among the preservatives of life.

180. But pain, when more violent, produces too severe irritation, inflammation, and it's consequences, fever and all the evils which proceed from excessive motion of the fluids; it agitates the whole *nervous system*, and induces intense watchfulness, convulsions, delirium, debility, and faintings.

181. Excessive pain, neither mind nor body can long sustain; and, in fact, Nature has assigned certain limits to it's intensity, which it cannot exceed without inducing delirium, convulsion, or fainting, or, in short, death itself, to relieve the wretched sufferer.

182. Pain, though milder, when long protracted, often induces debility, torpor, palsy, and rigidity of the part affected.

183. The endurance of pain depends much on the resolution of the patient; and in proportion as he bears it, the evils attendant on it will be the slighter or the more severe. For in this, as in other instances, the burden is the lighter that it be well borne.

184. Pain, if not too violent, or attended with fever or anxiety, seems, on some occasions, to brighten the genius, and give it acumen. Some, who have been afflicted with the gout, allege their own experience of this.

185. From the pain which they feel, men form some judgment of the manner in which it's cause operates: by puncturing, lancing, tearing, burning, &c. they imagine to themselves some correspondence or resemblance be-

tween things which they have seen or otherwise known, and those which are more obscure.

186. Anxiety is another troublesome sensation, quite different from pain, more obtuse, which cannot be so accurately referred to any particular part, and is often more insupportable than any pain. We must here carefully discriminate between this anxiety, of which we treat in a medical sense, and that of which we speak in common conversation. The latter depends not on the state of the body, but on that of the mind, and arises from the dread of danger foreseen, or great impending calamity. The former is truly corporeal, originating, like pain, in a certain state of the body. There is nothing, however, to prevent the presence of both at the same time, or the one from being the cause of the other. In fact, great bodily anxiety will impress the firmest heart with dread and anxiety of mind: and this again, when severe and lasting, by breaking down the powers of the body, especially those which maintain the circulation, will be sufficient to induce the other.

187. Anxiety, in the medical sense, arises chiefly from some cause disturbing or impeding the motion of the blood, through the heart and the large vessels contiguous to the heart and lungs. Hence it is an attendant on manifold disorders of the heart and it's vessels, such as enlargement, constriction, ossification, polypus, palpitation, *syncope*, inflammation, debility, and of course, some affections of the mind.

188. It proceeds also from every difficulty of respiration, whatever be the cause of the latter; doubtless, because the exhalation of mephitic air from the lungs, and that salutary change which respiration effects on the blood, are impeded; and perhaps because the blood itself passes less freely through the lungs. Anxiety of this kind is felt deep in the breast.

189. It is said also to arise from the more difficult circulation of the blood through the liver, and the other abdominal viscera.

190. A certain kind of anxiety familiar and very distressing to *hypochondriacs*, arises from the stomach

and intestines being either oppressed with a great load of crude and corrupted aliment, or distended with air extricated during a process of impaired digestion. The stomach being a very delicate organ, is, by such a load or distention, rendered uneasy; no wonder then if it be attended with an unpleasant feeling; meantime, it's distention impedes the free descent of the diaphragm, and thus obstructs the respiration. This kind of anxiety is greatly and suddenly relieved by a discharge of the air, and is easily distinguished by this, and other symptoms of a bad digestion. In these cases, the anxiety is usually, but rather inaccurately, referred to the stomach.

191. Anxiety, also, in a greater or less degree, often accompanies fevers of every kind: owing partly to the general debility, partly to the blood being driven from the surface of the body, and accumulated in the large vessels, as in the attack of intermitting fever; or also to the stomach, when disordered, oppressed with a load of crude or corrupted food, or distended to nausea with drink, especially warm, or medicated. As the fever increases, the anxiety becomes more and more severe, peculiarly so, as practitioners affirm, immediately before the crisis, or the night which precedes it; before such eruption on the skin, haemorrhage, sweat, or diarrhoea, as sometimes carry off fevers. A patient is likewise oppressed with anxiety in the case of an eruption repelled, or of a salutary translation.

192. Farther, anxiety equally accompanies fevers, and the most part of diseases, when in the last ebb of life death is approaching, of which it is the forerunner and symptom: it comes on, when the vital powers, no longer adequate to their proper functions, cannot carry on the circulation. But what kind of anxiety this is, may be easily gathered from the other symptoms of approaching death.

193. Again, anxiety may proceed from the same causes during sleep: hence the horrible dreams which often break the slumbers suddenly and with terror.

194. Itching is a restless feeling, attended with an

inclination to scratch; it is often very troublesome, though it has more affinity to pleasure than to pain.

195. As pain proceeds from severe irritation, either *mechanical* or *chemical*, so itching proceeds from irritation in a slighter degree. The tickling or friction of a flannel shirt, excites this feeling in one not accustomed to it, if his skin be delicate. Many acrid substances derived from animals, plants, or fossils, produce the same effect. Thus, the first feeling from *Cantharides*, applied to the skin, is itching; but when augmented it becomes pain.

196. Some acrid substances applied to the skin, as in fevers accompanied with cutaneous eruption; or in the kings evil; or, in a word, various diseases of the skin itself, such as the itch, or leprosy, have the same effect.

197. Lice, or worms, especially *ascarides*, irritating the skin or intestines, excite a troublesome itching.

198. A certain kind of internal itching impels men to many actions necessary to the body both in health and sickness; as to the discharge of urine, or of the contents of the bowels; to coughing, sneezing, and the like.

CHAP. VI.

Of taste; it's uses, varieties, and disorders.

199. The principal organ of taste is the tongue; which possesses more acute sensibility towards the tip or point, but more obtuse the nearer to the throat: though, in fact, some acrid substances, the taste of which is scarcely felt at the point, when applied near the root of the tongue, or in the throat itself, excite a very keen sensation.

200. The tongue is furnished with remarkable and very beautiful nervous papillae, which seem to be the proximate seat of the sense. In tasting, these are elevated and erected that their sensibility may be more acute.

201. Nothing affects the organ but what is soluble in the saliva, which is little else than water, that, being applied to the tongue in a fluid form, it may pervade it's envelopes, and affect the nervous papillae. Hence insoluble earths have no taste.

202. Nor is the solubility of a body the only requisite to our tasting it: it is necessary that it possess some degree of saltness, or at least of acrimony, that it may stimulate the nervous substance. Therefore, whatever is not so salt or acrid as the saliva itself, has no taste.

203. The various kinds of tastes are easily distinguished, and therefore, even in common discourse, have obtained appropriate names; as, for instance, taste is said to be acid, sweet, bitter, salt, pungent, aromatic, or putrid; but this last term is also descriptive of smell. Of all these tastes there are various degrees, and all may be variously combined among themselves.

204. Some tastes are very sweet and agreeable, others

disagreeable, or nearly intolerable. There is, however, a wonderful diversity among individuals in this respect; so much so, that what affords the greatest pleasure to some, is by others rejected with nausea and abhorrence.

205. Farther, persons begin in a short time to be disgusted with the sweetest tastes, which at first gave them great pleasure: while, by the power of habit, they contract a relish and appetite for some of the worst and most disagreeable in nature, such as that of *tobacco*, *assafœtida*, and the like.

206. The chief use of this sense seems to be to invite to food which is good and salutary, and to avoid that which is noxious and improper. For the best and greater part of food is agreeable to the taste; but those kinds which are offensive to an uncorrupted taste, are in general noxious. Irrational animals are directed to their proper food, and restrained from that which is noxious by an instinct of this kind, which is seldom fallacious, and which receives assistance from the sense of smelling.

207. But this instinct, like others, is bestowed on beasts in greater perfection than on man; who being endued with other faculties, is not so dependent on such assistance. The degree of instinct, however, which is bestowed, is frequently corrupted by a mode of living inconsistent with nature.

208. Again, the bountiful Parent of all has ordained, that an action so necessary to the support of life, and in it's nature somewhat voluntary, should not be destitute of some degree of pleasure. We are allured to take and masticate our food by it's agreeable and enticing relish. In fact, that pleasure depends greatly on the state of the stomach, and the necessity of renewing our food: for the coarsest, though nearly unsavoury, is very relishing to a hungry man, but to one who is filled with meat, it occasions disgust. Farther, during mastication, the saliva flows more copiously, and thus the sense of taste is rendered more acute, and the food more agreeable. When a person is hungry, the saliva flows at the sight, or even at the resemblance

or recollection of relishing food by which his appetite is excited.

209. The sense of taste is seldom observed to be too acute, unless when the cuticle which covers the tongue is disordered. If this be removed, wounded, or overrun with ulcers, *aphthae*, or the like foulness, then the sense becomes too acute, and tastes are not perceived without pain: and sometimes no taste is distinguished, but pain alone is felt.

210. This sense, like that of touch, becomes defective by various disorders of the brain itself, and of the nerves; but such instances are rare. Some persons have the sense of tasting very obtuse: these have likewise the power of smelling in an inferior degree. It very often fails through defect of saliva; for a dry tongue cannot feel taste. Hence it is obtuse in many diseases, especially fevers, catarrh, &c. from the defect both of saliva and of appetite, which assist it so much in a healthy person; or because the tongue itself is covered with a tenacious and filthy mucus.

211. The sense of taste is often depraved. We either feel taste when nothing at all is applied to the tongue; or when any thing is applied to it, we have a perception foreign from the true and accustomed taste. This is generally owing to the disorder of the saliva, which is itself the chief matter tasted. In this way we may have the perception of a taste, sweet, salt, pungent, bitter, putrid, or rancid, according as the saliva is depraved, from the state,—either of the general mass of the fluids, of the organs which secrete the saliva itself, of the mouth, or of the stomach, whence, especially if it be disordered, vapours and eructations ascend to the mouth.

212. But, independently of the faults of the saliva, the sense of taste may be depraved by other causes, as by the condition of the nervous papillae; of this, however, little is yet known. For the taste is sometimes quite perverted, although the saliva itself has no taste when examined by other persons.

213. Practitioners are in the habit of paying much attention to the condition of the tongue in all diseases,

especially in fevers; nor is this attention improper, for from it they can judge concerning the state of the stomach; concerning the thirst, or rather the necessity for taking drink, when through delirium or stupor, the patient neither feels thirst, nor is able to complain of it; in short, they endeavour to form some judgment of the nature, increase, or remission of fever, from inspection of the tongue.

CHAP. VII.

Of the sense of smelling; it's uses, varieties, and disorders; also of the nature of smells, and their effects on the human body.

214. THE seat of this sense is in that very soft, very delicate membrane, full of nerves and blood-vessels, which lines the internal nostrils, with the several sinuses and cavities to which they lead. About the septum and ossa spongiosa, where the membrane is thicker and softer, the sense is more acute than in the deeper cavities, where the membrane is thinner, and not so full of nerves and vessels, though these parts also would seem not altogether destitute of the sense of smelling.

215. As taste makes us acquainted with the soluble parts of bodies, so, by the sense of smelling, we judge of their volatile and most subtile parts which float in the atmosphere. In order to exercise this sense with accuracy, one shuts his mouth, and, with his nostrils expanded as wide as possible, forcibly inhales the air, that the volatile particles may be applied to the organ of scent in greater numbers, and with greater force.

216. Also, that the sense may be more acute, the organ of smelling, like that of taste, is kept moist; partly by it's proper mucus, partly by tears which constantly distil from the eyes.

217. As the sense of taste is seated close by the route which the food must take, so that of smelling is stationed as a guard at the entrance of the way through which the breath must pass, to give warning lest any thing noxious be admitted into the body by a communication which is always open. Farther, like taste, this sense also invites to salutary food, but deters from that which is noxious or corrupted, especially if putrid or rancid.

218. Besides, certain smells have a very powerful influence on the *nervous system*, and sometimes produce astonishing effects. Some produce an agreeable excitement, and almost instantly restore us when on the point of faint-

ing: others induce fainting fits, and, on some occasions, it is said, entirely extinguish life. To this place also may be referred antipathies, feelings truly ridiculous, but frequently too powerful for any resolution to conquer.

219. The sense of smelling is sometimes rendered too acute, either from disorders of the organ itself, (a case more seldom observed,) or from an excess of sensibility in the whole *nervous system*, which sometimes occurs in certain fevers, in phrenitis, or in *hysteria*.

220. It is often rendered obtuse, in consequence either of disorders of the brain and nerves, proceeding from external violence affecting the head, or from some internal cause; or of disorder in the organ itself, either become arid, through the accustomed humours being suppressed or diverted into some other channel, or overwhelmed with a superabundance of mucus and tears. Catarrh furnishes an instance of both these disorders of the organ; for, in the beginning of the disease, the nostrils are parched, but afterwards are either inundated with abundance of humour, or obstructed with too thick a mucus. But in these, and many other cases, the membrane of the nose is itself affected with inflammation, relaxation, or too severe tension, whence the nerves, of which it is in a great measure composed, cannot escape disorder. Again, whatever impedes the free entrance of air into the nostrils, or it's passage through them, cannot fail to injure the sense of smelling.

221. This sense is sometimes depraved, and smells are perceived where there is no odour, or those perceived differ widely from the usual and genuine smells of the substances presented. Odorous particles, breaking forth after long detention in the cavities, and anew affecting the organ, sometimes produce such depravation in a person of the soundest health. Many faults too of the nostrils, and parts leading to them, as ulcers, caries, cancer; any disease of the mouth, teeth, throat, or lungs; bad digestion also in the stomach, by exhaling a fetid vapour, may induce a depraved state of this sense. Perhaps it may sometimes be occasioned by faults of the brain and nerves, the reason of which is rather obscure.

CHAP. VIII.

Of the sense of hearing; of sounds; and disorders of that sense.

222. This is excited by tremors of the air produced by sounding bodies. These tremors are collected by the external ear, which is of cartilaginous structure, and by both the auditory passages; they are conveyed to the tympanum, their intensity being increased at the same time, that they may strike it's membrane with the greater force. This membrane being thrown into commotion and tremor, agitates the annexed malleus, causing it strike the incus with which it is connected, to which effect the peculiar muscles of the malleus contribute. The incus again imparts it's motion to the *os orbicularis* and *stapes*, which last, partly by the impulse given, and partly by the action of it's own muscle, is moved in such direction that the posterior part of it's base is pushed against the fenestra *ovalis*, and the vestibulum itself. Again, the tremors of the membrane of the tympanum are at the same time communicated to the air which has entered the tympanum through the *Eustachian tube;* which air, in short, strikes the membrane of the fenestra rotunda, and thus the sound reaches the labyrinth or innermost ear. It would appear, then, that there are two ways by which these tremors reach the labyrinth, which is the ultimate organ of hearing, and which is wholly lined with a very soft and highly sensible nervous membrane, and filled with a fine pellucid water, somewhat reddish, very much adapted to receive and propagate every tremor.

223. Of the actions of the several parts of the internal ear nothing is certainly known, except that those small bones are very much adapted to receive and com-

municate tremors, and thus contribute to hearing; so much so, that by means of the teeth, the maxilla and os petrosum, sounds reach the innermost nervous portion of the organ; thus a man nearly deaf, who hears nothing by the medium of air, may enjoy music in some degree. It must be confessed that there is much obscurity here, and that the action and uses of many parts in the ear, are as yet but little understood.

224. Sounds are either loud or low, grave or acute. The loudness or clearness of sound depends on the force or magnitude of the tremors which the sounding body imparts to the air: the depth of tone on the number of tremors which take place in a given time. There are, however, certain bounds which limit the capacity of hearing; if the tremors fall short of the requisite intensity, or transgress the proper limits, there is either no sound, or it is very shrill, grating to the ear, and scarcely supportable.

225. Again, sound is rendered more intense by repercussion from many bodies which receive and return the tremors of the air. As often, therefore, as reflected sounds are in concord with the primary one, they strike the ear along with it, and render it stronger. Hence the voice is stronger in a room than in the open air. But if reflected sounds reach the ears after a certain interval, they are heard distinct from the primary sound, and form an echo.

226. The variety of sounds is immense; as the slightest changes or combinations of them are perceptible to an acute and scientific ear. Their power also over the mind, and of consequence over the body of man, is extensive. They call into action the various affections of the mind, especially the melancholy and the sprightly; and many derive from this inexhaustible fountain the purest and sweetest pleasures. But what is called a musical ear, is not the endowment of all, the reason of which is not yet explained. It by no means depends on the acuteness or obtuseness of the sense of hearing, for persons partially deaf are sometimes skilled in music and great amateurs, while many who hear dis-

tinctly find little enjoyment in it: and a man has suddenly, and without any known cause, lost that musical ear which he had in great perfection, while his hearing remained yet unimpaired. Nor is there any reason for ascribing it to not hearing equally by both ears. The faculty itself is the gift of nature, not to be acquired by study; but like the other faculties of man, it may, by cultivation and practice, be improved and strengthened to an astonishing degree.

227. Of all the senses, that of hearing is, in general, the most frequently disordered, which indeed is not surprising, as it's organ is very delicate, and composed of a great many, and these very minute parts.

228. The hearing is frequently too acute, either owing to the general habit of body becoming irritable to excess, which often happens to *hysterical* females, or those in child-bed; or to excessive sensibility of the brain itself, which is not unfrequently observed in fevers, in phrenitis, and sometimes, though more rarely, in true insania; or to the ear itself, when disordered, and affected with inflammation, pain, or too great tension.

229. This sense is blunted or utterly destroyed, rendering the patient either dull of hearing, or completely deaf, from causes nearly similar, and differing only in degree or magnitude,—as from defect of the external ear, owing to obstruction of one or both auditory passages by mucus, ear-wax, pus, or some thing extraneous; or to concretion, which has been observed to take place after suppuration, and sometimes after the small-pox;—from the membrane of the tympanum having become too rigid, relaxed, eroded, or ruptured;—from some obstruction in the tympanum or *Eustachian* tube; —from some of the membranes, small bones, or muscles of the labyrinth being affected with concretion, *spasm*, palsy, or torpor;—or, in fine, from various disorders of the brain or nerves, while the structure of the organ is not injured. Hence deafness is frequently a disease of the *nervous system*, attacking suddenly, and going off spontaneously; hence also it is common in old age,

when the solids are become rigid, and the nervous parts less sensible.

230. In fevers, especially of that kind which is usually attended with great debility and stupor, patients often become deaf: and, on some occasions, when joined with other symptoms of great oppression of the brain, or of the strength being exhausted, deafness may perhaps prove an unfavourable symptom. But for the most part, it is a very favourable prognostic, even when some degree of drowsiness attends it. The reason of this is indeed sufficiently obscure, and perhaps no other can be given, than that such deafness arises from some such disorder of the brain as is not in it's nature attended with any great danger: while the other extreme of too acute hearing is owing to some degree of inflammation attacking the brain,—a circumstance always very dangerous.

231. The sense of hearing is frequently depraved in such a way that sounds are heard as of a drum, a bell, or fall of water, when there is no tremor in the air, and a healthy person hears nothing at all. This disorder is called ringing of the ears, of which several varieties have been observed. The inconvenience is for the most part slight and temporary; yet sometimes becoming obstinate, protracted, and very troublesome, it distresses the patient day and night.

232. This disorder frequently proceeds from a very slight cause, even a partial obstruction of the auditory passage, or of the *Eustachian tube;* whence it happens that the air, having but imperfect or interrupted access, strikes the membrane of the tympanum, or perhaps the interior parts, with unequal, or excessive force: hence, in the act of yawning, bombi, a species of this ringing, are heard by a person in the soundest health.

233. A more frequent and distressing *tinnitus* accompanies many diseases, both fevers, and affections of the *nervous system.* This arises partly from the increased impetus of the blood toward the head, (while the sensibility of the *nervous system* is increased at the same time,) and to such a degree, that the very pulsations of the arteries are heard; partly from the increased sen-

sibility and irritability of the nerves and muscles of the labyrinth of the ear; whence it happens, that the parts which ought to be entirely at rest till excited by the tremors of the air, are put in motion of their own accord, and communicate the same to other parts already too sensible.

234. Ringing of the ears likewise proceeds from vehement mental affection; in some cases, from a disordered stomach; in others, from a *rheumatic* affection of the head and ears, or catarrh, which usually affects the tube; sometimes, however, it attacks unattended with any other disorder, and proves, indeed, no trifling disease.

235. There are, however, various causes both of this and of other disorders of the sense of hearing, which it is often very difficult to distinguish. This is owing, in some degree, to the deep concealed site of the organ; but not less to the inaccurate state of our knowledge of the actions of the several parts. The consequence of both is, that in affections of the sense of hearing, a cure cannot be accomplished with ease or certainty.

CHAP. IX.

Of sight, its varieties, and disorders.

236. The rays of light, emanating or reflected from every point of the luminous, or illuminated body, which we are contemplating, fall upon the *cornea* of the eye. Those which are very oblique, being again reflected, or suffocated and lost in the *uvea*, or in the black pigment which lines the *ciliary processes*, never reach the interior parts of the eye. But those rays which fall more directly on the *cornea*, being transmitted through that pellucid membrane, and through the aqueous humour which is next it in position, and having become now a good deal refracted, arrive at the crystalline *lens*. By the power of this *lens*, and of the vitreous humour which is next it, they are still more refracted, and at last collected into a point called the *focus*, and thus they paint upon the *retina*, a very beautiful and distinct, though inverted image, of the object from which they proceeded.

237. This very delicate, nervous membrane, the *retina*, is indeed the ultimate organ of vision, and by the inverted image of the object painted on it, one whose brain and optic nerve are sound, sees that object erect, distinct, and expressed in its proper colours.

238. The eye is furnished with various humours, though one might have sufficed for refracting the rays, collecting them into a *focus*, and forming the image on the *retina*. Nature, which uses no contrivance in vain, seems to have been thus liberal, chiefly with the view of guarding against the change of colours which one simple *lens* usually produces, owing to the different refrangibility of the rays of light, and thus enabling man to form a judgment with due accuracy of the genuine colours of

bodies. For it is ascertained by the most accurate experiments, that a compound *lens*, constructed on a certain principle, is free of the serious inconvenience attending one of a more simple form. The same purpose seems to be served in a considerable degree by varying the density of the several humours of the eye in particular parts. Perhaps, in this way, by the different refracting powers, the different degrees of refrangibility, in the rays themselves, are compensated.

239. The vitreous humour, indeed, which constitutes the far greater part of the whole humours of the eye, is of no small utility, filling up the globe of the eye, and properly distending the *retina*, that so it may represent almost a concave sphere, and that a greater number of it's points may receive distinct and accurate images of visible objects. For had the bottom of the eye approached nearer to a plane, or to almost any other figure than the spherical one, a single point only of the *retina*, suppose its centre, would have had distinct vision, on account of the unequal distance of the various parts of it from the centre of the eye: whence the rays falling on it's other points, either not being sufficiently refracted, or having been already collected in a *focus*, and again diverging, by painting a confused image on the *retina*, would have greatly injured vision.

240. The eye is spherical, that the rays transmitted through it may be collected into a just *focus* before they fall on the *retina*. For the same reason the *cornea* is convex and prominent, and the more so the flatter the form of the eye belonging to any class of animals. Besides, the spherical form of the eye contributes much to the freedom and rapidity of it's motions.

241. An admirable sympathy and harmony is observed between the two eyes, and between the several parts of the same eye. One eye follows spontaneously the motion of the other; that the axes of both may always be parallel, and that, though not without effort, yet with a very slight one, by instinct, or spontaneously, they may be both directed to the same point of the object that is viewed. By this means it's image

is formed nearly on the centre of each *retina*; for that will almost always be found the place of the most perfect vision.

242. The pupil expands in the dark, but on the admission or increase of light, it immediately contracts; and this is entirely to be attributed to the consent between the *retina* and the muscle which directs the pupil and contracts or enlarges it, and not at all to the irritation of the muscle itself. For granting that the muscle is perfectly sound, if there be no vision, there is no contraction of the pupil. The muscles of the pupils of both eyes are also in harmony; so that when light is admitted to the one, the pupils of both are contracted at the same time.

243. The pupil is also contracted when any thing is narrowly inspected nearer to the eye than the usual limits of distinct vision. The apparent design of this is to exclude superfluous and very oblique rays, such as by the refracting powers of the eye could scarcely be collected into a proper *focus*. It would seem to be for the same reason that the pupil is very wide in infants and young persons, while it is generally more contracted in old people, whose eyes usually become more flat. It is not yet fully agreed whether there be still other modes by which the eye accommodates itself to the various distances of the objects which it contemplates; but some have supposed that this is the use of the *ciliary processes*, namely, that they may turn the *lens* aside from it's usual position, and draw it farther from the *retina*, that the rays may be more refracted before they fall upon it. But it is very certain that the eye, whether by these powers of the muscle which directs the pupil, or of the *ciliary processes*, or by other means unknown, is somehow changed, and, within certain limits, accommodated to the various distances of the objects which it contemplates.

244. It has been long a subject of much dispute among *physiologists*, *mathematicians*, and *metaphysicians*, by what means it happens, that from an inverted image painted on the retina, we see the object itself

erect, and how, by means of a double image, namely, one in each eye, one object only is beheld.

245. The questions being of little utility, forbid the physician to enter into a dispute which has honourably occupied the talents of so many eminent men. Yet it is useful to know the result, namely, that on this subject, it is a simple law of nature, that every object of vision is seen in the direction of a straight line, from the point of the *retina* on which it's image is painted, passing through the centre of the eye. No experiments or arguments have yet been produced, shewing that this direction is mathematically true; but, on the other hand, no error, not even the slightest, has been detected in this matter. We are, therefore, under a necessity of concluding, from experiments already made, that the direction in which the visible point is seen, is either the one mentioned, or one extremely near to it. Man, then, being thus constituted, under such an established law of vision, would have seen the object inverted, had the image been erect; and, from the like cause, he sees erect, those which are painted in an inverted position.

246. It is a complete mistake, though at first glance it might seem a very simple and evident truth, that an object is seen according to it's real position and direction; or in the direction in which the rays of light fall on the *cornea* or *retina;* for, by an easy experiment, any object may be made to appear out of it's real place, or in many places at the same time; and the rays diverging from any point, have so many different directions, either upon their first entering the eye, or when, refracted by it's various humours, they reach the bottom of the eye, that if vision were regulated by the direction of the rays, every visible object would be seen in several directions at the same time, and would appear multiplied and confused.

247. The question respecting the simplicity of vision from a double image, which at first was not proposed in a form sufficiently precise, was afterwards more accurately stated. It is not indeed matter of fact, that vision is always simple, even in a person of the soundest

health. It is either simple or double according to the way in which the eyes are directed to the object which we view. When the axes of both eyes are directed to the same point, the double image of that point, viz. one formed on each *retina*, produces simple vision. Farther, any number of objects whatever, situated on either side of such a point, at an equal distance from the eye, are seen single; their images drawn on the *retina* of each eye, occupying the same position respectively with it's centre. The centres, therefore, of the two *retinae*, and the points which respectively have the same position in reference to the centres, above or below, to the right, or to the left, are said to correspond or to produce single vision. But objects placed at a lesser or a greater distance from the eye than the point to which both axes are directed, may be seen at the same time, and are seen double. It were easy to show that the images of such objects occupy points of the two *retinae* which are not similarly situated in respect of the centre; that they are formed on the right part of the one eye, and on the left of the other. Parts, therefore, of the *retinae*, not similarly situated in respect of the centre, do not correspond; that is, they give a double vision of that object the image of which is painted on them.

248. Of this sense certain varieties or slight disorders are often observed, which are scarcely accounted diseases. Those are denominated *Myópes*, who are short-sighted, that is, who see nothing clearly or distinctly, unless it be brought very near the eye. This is owing to the too great refraction of the rays of light, their being too early collected into a *focus*, and again diverging from it ere they reach the *retina*, the image on which is thus rendered indistinct. The most frequent cause of this disorder is too great convexity of the whole eye or of some of its humours, as a very prominent *cornea*, &c. which refracts too much the rays of light in their transmission through the eye. This inconvenience, familiar to people in the early period of life, is said to be sometimes alleviated on the approach

of old age; but this is not uniformly the case. When a slight degree of this disorder is at first observed, it may be in some measure corrected by a habit of contemplating remote objects, and refraining from the view of very minute or near objects; as, on the other hand, by an opposite practice, the disorder may be acquired: for the eye accommodates itself in some measure to the distance of the objects which it views (247.) A concave glass, which makes the rays more divergent before they fall on the eye, is the simplest and the surest relief to the short-sighted.

249. Those are called *Presbyopes* who are long-sighted, having a confused vision of near objects, and a distinct one of those more remote. The causes of this disorder are the opposite of those of the former. It is chiefly owing to an eye so flat, that it affords not due space for the refraction of the rays; hence it is frequent with old people, even those whose sight was good in their vigorous days. It is usually relieved by a method well known, the use of a convex glass.

250. *Hemeralopes*, are those who see only by day, or in a vivid light; but in the twilight, in the night, by moonlight, or by candlelight, are nearly or altogether blind. In some cases, a fault of this kind seems to have been owing to a pupil too contracted and rigid, not admitting a sufficient portion of such feeble light into the eye. In other cases, it seems owing to a defect of sensibility in the retina itself, or to other causes still more obscure, as when it seizes many people at the same time and place; a circumstance sometimes observed.

251. *Nyctalopes*, are those who see better by night, or by a very faint light, than by day, or with a more vivid light. This affection of the sight is rare in man, and is owing to excessive sensibility of the *retina*, or to a pupil too much dilated, or incapable of due contraction. Persons even of the soundest organs suffer an inconvenience of this kind, but slight and temporary, when, after being long in darkness, they return suddenly into the light.

252. The internal surface of the whole eye is besmeared with a black paint, which pertains to the *choroides*, and *ciliary ligaments;* perhaps with this design, that the eye may be rendered a most complete camera obscura, and that the image painted on the *retina* may be the more accurate, and not confused by any reflected rays. It is said there are some poor wretches, termed white Ethiopians, who, like white rabbits, have the *choroides* of a red colour. Persons furnished with such a *choroides* see better by night, but little or nothing by day.

253. Animals, however, which seek their prey by night, the feline genus, the owl, and the like, have the *choroides* coloured, resplendent, and well fitted to reflect the rays of light. By this means, as some think, they have vision, not indeed very distinct, but such as suffices even in the night for catching their prey; but this is not yet fully explained. These animals are also furnished with a very moveable pupil, dilating itself from a very fine and scarcely visible slit, into a great circle, according to the degree of light, and with a *retina* apparently of exquisite sensibility. Certain of these animals, like the white Ethiopian, do not see well while the sun shines: Is the fault equal in them all? It would seem not. Is it corrected by the very close contraction of the pupil, admitting but a small portion of light to enter the eye? Is it credible that the *choroides* itself reflects a greater or less degree of light, as circumstances may require; and farther, that such faculty of reflecting light depends on an influx of blood into the membrane, full as it is of small vessels, which influx, the animal may in some measure direct? The circulation of the blood in it's more vigorous state, (and of consequence various affections of the mind,) gives a splendour to the eyes of all animals, and of man himself: when the former languishes, the latter is obscured; and when the circulation finally ceases, the splendour of the eye is entirely extinguished.

254. The sense of sight is obnoxious to many and severe disorders. It is sometimes rendered excessively

acute, so that the patient either sees nothing distinctly, or not without great pain. As in the other senses, so here this may happen from excessive sensibility in the general habit of body; from a peculiar state of the brain, common to phrenitic patients, or persons labouring under other febrile diseases, such as the inflammation of the brain or of its membranes. More frequently, however, we become impatient of light from the condition of the eye itself. The inflammation of the *adnata*, and of the anterior part of the *sclerotica*, usually spreads to the posterior parts of the eye, and of course to the *choroides* and to the *retina* itself; hence proceed an impatience of light, pain, and great irritation, sometimes inducing or increasing delirium.

255. The sight often becomes obtuse or is quite destroyed by mere age, partly through the increasing flatness of the eye, owing to the scanty supply of the aqueous humour and waste of the *cornea*, the *lens*, or the *vitreous* humour; partly from the *cornea* becoming dry and opaque, owing to the more languid circulation, and many of the smaller vessels being obstructed, closed or choaked up; or partly from the *lens* acquiring a shade of yellow or amber colour, and from the impaired sensibility of the *retina* itself: for old age abates every sensation.

256. Sometimes the sight is entirely lost in consequence of various injuries sustained by the brain, the *optic* nerve, or the *retina*, while the fabric of the eye itself is unhurt. A disorder of this kind is called *amaurosis* or *gutta serena*; it is readily distinguished by the pupil being dilated and remaining immoveable, while the humours remain transparent, and is in general attributed to compression, to congestion of blood, or to a stupor affecting the nerve. If part only of the retina be torpid, black spots are seen in the objects which we contemplate, and flies dancing before the eyes: this is a frequent symptom in fevers, but a very unfavourable one, and almost always fatal.

257. Again, the sight is frequently destroyed, when any of the parts through which the rays must pass and

be refracted, become obscure or opaque; when the *cornea* becomes covered with spots impervious to light; when the aqueous humour is mixed with blood, serum, or pus; when the *lens* acquires a dusky colour, which often happens, and is called a cataract; or when the vitreous humour is corrupted in a similar manner; or in fine, when all the humours of the eye, by inflammation or suppuration, are dissolved, confounded, or mixed, so that they either transmit no light, or permit it to pass more sparingly and unequally; whence it happens, that either no image, or one obscure, distorted, imperfect, and indistinctly coloured, is painted on the *retina*.

258. Impediments of vision, external to the eye, such as disorders of the eye-lids, or of the neighbouring parts, from swelling, concretion, or inflammation, require no explication. The truth is, it can be no fault of this sense, though one have no vision, if no light has been admitted to the eye.

259. Vision is sometimes depraved, and objects appear in false colours, or though this is more rare, their figure and position may be seen different from the true. This takes place when the humours are tinged with any unusual colour, as is alleged to happen in the jaundice, (though that is very doubtful,) or in consequence of extravasated blood being mixed with the aqueous humour. There is a remarkable depravation or defect of sight, constant and uniform, in persons otherwise perfectly sound and well sighted, which has been more than once observed, when they are incapable of distinguishing certain colours, as for example, green from red. It is depraved in a different manner, when, on light being excluded from the eye, we behold sparks of fire, flaming or gold coloured drops, or various colours. There is a disorder, for the most part slight and fleeting, familiar to constitutions of great sensibility and mobility, which apparently arises from a slight impulse on the *retina*, by the arteries chiefly beating irregularly or with more than usual force: if the eye-lids be shut, and the eye pressed with the finger, a circle of flame is seen. Perhaps we might account in a similar way for

the spark which some epileptic patients see increasing to an immense and splendid ray of light, immediately before falling into a fit. Persons in whom animation has been restored after strangling or immersion, have affirmed that they saw such a beam or ray. Doubtless when the respiration is stopped, and the veins of the head turgid with blood, they strike and compress the whole brain and nervous parts in the head: Farther, such sparks are observed, and with no favourable prognostic, by those persons in fever, over whom phrenitis or high delirium is impending. They are observed also by those who are about to be attacked by the more severe diseases of the head, by palsy, *apoplexy*, or *epilepsy*. Can a perception of light, where no light is, be properly attributed to the nervous fibres of the *retina*, acquiring motion spontaneously?

260. There is a kind of disorder not very rare, which appears somewhat surprising and difficult to explain, namely a distinct but false vision of objects of sight which have no existence. This ought not to be imputed to any disease in the eye, but to a diseased brain, to insania, or to delirium.

261. A frequent disorder of sight is that distortion of the eyes, which by practitioners is called *strabismus*. A strabo, or patient affected with strabismus, has the axis of the eyes more oblique than usual, and not directed to the same point. This often amounts to great deformity, and produces imperfect, uncertain, or sometimes double, and of course confused vision. The evil is for the most part congenital, and is not unfrequently corrected by the efforts of the infant, as yet unconscious of the blemish, to have a more agreeable and distinct vision. It is very easily acquired by imitation, by which all, especially in infancy, are greatly and even unconsciously influenced : but it is not so easily unlearned.

262. It is probable that the cause of so great a disorder most frequently exists in the muscles of the eyes, which having a bad conformation, or being depraved by palsy, rigidity, or contraction, cannot direct the eyes in a regular and equal manner.

263. This disorder is sometimes induced by *epilepsy*, in which all the muscles, those of the eyes especially, are most violently convulsed, whence perhaps arise their distortions, lacerations, or other irremediable diseases.

264. On some occasions it has accompanied certain diseases of the head, especially hydrocephalus. Distortion of the eyes is sometimes brought on by a violent contusion on the head; and sometimes, though very seldom, it comes on suddenly without any known cause.

265. It may affect either one, or both eyes: the distortion of which may be greater or less, or in any direction whatever.

266. Some have persuaded themselves that the disease sometimes proceeds from a disorder of the *retinae*, as, when their usual points, their centres, and points similarly situated in respect of their centres, do not correspond: such a case will be attended with contorsions to prevent double vision. This seems also to be the reason of the shocking increase of the distortion, when the patient brings any object near to the eye to view it; or when the centre of one or both *retinae* possesses little or no sensibility, a person must of necessity distort his eyes that he may see. Thus, for example, if the *optic* nerve had not entered the eye obliquely, but had occupied the centre of the *retina*, we should all have squinted, or have had double vision.

267. Medical men are pleased to refer to the sense of sight a certain very troublesome feeling, which we denominate vertigo, though in fact it is equally connected with touch, or rather with consciousness; for the disease remains though one shut his eyes, or go into darkness.

268. The disease is called vertigo, when we believe that we see or feel ourselves and objects near us, staggering, trembling, carried round, or moved in any way, while in fact all are at rest. If vertigo be more severe, the patient cannot see, from a mist or darkness, as it were, spread over his eyes; nor can he walk or stand firmly, from the failure of those powers which direct his

limbs. Nausea usually attends vertigo, and the one induces the other.

269. Vertigo is observed to be an attendant, symptom, and forerunner of many diseases, some of them severe ones too: it attends *apoplexy*, *epilepsy*, *hysteria*, haemorrhages from the nose or other parts, amenorrhoea, great plethora and fevers, whether attended with debility, or with an increased impetus of the blood toward the head. It is brought on by violent strokes on the head, though such violence seldom affects the eyes particularly, unless so far as the head in general is affected. A great and sudden loss of blood and other fluids, debility, *syncope*, various diseases of the intestinal canal, particularly the stomach, many poisons taken into the body, especially *narcotics*, opium, and the like, wine, and all strong liquors, usually produce vertigo: hence it is a symptom of every species of intoxication. Various kinds of motion too, induce vertigo in persons not accustomed to them, as rotation of the head or of the whole body, sailing, especially in a small vessel and rough sea, or other similar motions. In these and the like cases, unusual and irregular motions of the blood are excited, and communicated to the nervous parts in the head; or these becoming disordered by sympathy with other parts, produce a confused sensation like that from turning quickly round.

270. Farther, vertigo sometimes arises from the mind being affected in a certain way, as by the view of rapid rotation, of a cascade, or of a frightful precipice; or even without any view, from intense and rapid thought.

271. It is for the most part an attendant and symptom of other diseases, yet sometimes the principal or sole disease; returning at intervals, and aggravated by degrees, it impedes and undermines alike the functions of body and mind. Such a disorder as this, even the very firm and vigorous mind of a *Swift* was not able to resist.

CHAP. X.

Of the internal senses; memory, imagination, and judgment; their varities and disorders.

272. Beside the senses or powers already described, man possesses also others, which are denominated internal, for this reason, that they exercise their functions without external impulse or assistance; and the organs most subservient to them, being internal, concealed, and inaccessible to external objects, act by powers peculiar to themselves.

273. The perception excited by an external object, in it's own nature fleeting and perishing, terminates in a short time; but if the same object be anew applied to the organ, it not only renews the perception, but the person at the same time remembers the original sensation which he had, or knows that he had the same before.

274. This first and most simple form of memory is competent to the earliest period of life, as even a child of six months old exhibits it, while he recognises his parents or nurse, and shrinks from strangers. For distinction's sake, this power is called recollection, and seems to be the principle and foundation of more perfect memory.

275. Even when there is no application at all to the organs of the external senses, or aid from external causes, often while it is difficult to discern the internal causes, sensations felt long before, forgotten, and extinct, are involuntarily and unexpectedly renewed and revived. Such involuntary recollection approaches still nearer to perfect memory.

276. Memory is the name given in it's true and best sense to that faculty, by which our various past thoughts,

as sensations, perceptions, &c. are, in the order in which they had been received, recalled, detained, contemplated, or dismissed at our pleasure.

277. This has no place in the first stage of life; by little and little it is acquired and increased. In boyhood it is very prompt, vigorous and retentive; in youth and manhood it retains it's vigour; in elderly people it usually begins to fail; in extreme old age it is impaired, and at length quite destroyed. This generally takes place in the following manner: It more readily parts with matters of later occurrence, while it is still very tenacious of those of older date, and which happened in the flower of age; but as the load of years increases, the memory of all events, new and old alike, is utterly destroyed.

278. In some the memory is more prompt and retentive, in others, more feeble: it is incredibly improved by culture and exercise, provided these are not in excess. In promptitude and vigour it admits of great difference in different persons, and in the same persons at different periods of life, so that it may exercise it's function very slowly indeed, or with almost incredible rapidity. In this matter much depends on the person's good or bad health; on the state of mind, whether agitated by violent emotion, or enjoying undisturbed tranquillity, and attending accurately to its own reflections. We must also take into account the habit of body, as more or less sensible or irritable; the state of the circulation too is of great moment, whether accelerated or languid; in consequence of exercise, fever, pain, torpor, drowsiness, &c. In childhood, in youth, or in persons of uncommon vivacity, the memory is usually more rapid in it's acquisitions; and this among other things accounts for the judgment of such persons being inferior in steadiness and accuracy.

279. During sleep, at least of the lighter description, the memory is active, but not correct, or subject to the will; nor does it bring forth it's stores in their order, as it usually does in a sound and waking person.

280. Memory most readily retains the greater part of

new objects, those frequently repeated, the pleasant, the unpleasant, or those which in any unusual degree affect the mind. Above all things, order is of advantage, and we commonly employ it as the readiest auxiliary in recalling any matter whatever to remembrance. Memory is the fountain and origin of science of every kind, and of judgment; and therefore order commonly constitutes the greatest part of it, as being that without which there would either be no memory, or it would be vague and altogether useless, like that which takes place in a dream, or in delirium.

281. The memory is impaired, confused, or altogether destroyed by various diseases, especially by those which affect the brain, as by *apoplexy*, palsy, *epilepsy*, tumours within the head; by external violence, or by fevers, especially those in which there is an increased impetus of the blood toward the head, or in which the brain is in any way much affected.

282. It is very seldom that the memory is so depraved as to represent to the mind it's objects in a false order: but if such a disorder take place, it is to be referred to delirium, or to a diseased imagination.

283. Imagination is that faculty by which man at pleasure unites, divides, or disposes in a new order, the various objects which memory has stored up; as when, by mixing and compounding the shapes of a man and a horse, of a woman and a fish, he forms to himself a Centaur or a Siren.

284. Imagination is a more sprightly faculty than memory, and exercises a more powerful controul over the mind, it's affections, and the *nervous system*; though memory itself possesses such influence in some degree.

285. In a sound person, the innumerable conceptions which imagination suggests, are scarcely ever confounded with past things, which are the objects of memory; much less with things having a real and present existence, which are perceived by the senses. Nor can a person of sound body and mind, while sober, and awake, believe, that the inventions which his imagination frames

at pleasure, either have now, or ever had an existence. If any such mistake happen, it is to be accounted a disease.

286. In infancy there is little imagination; in youth it is most vigorous, in middle age it is more moderate, and in the old man nearly extinct. It is more vivid in the cheerful, the irritable, in those who are easily agitated, or whose sensibility is unusually keen; but in persons of a torpid, frigid, or stupid character, it is next to nothing. Poets are not the only persons indebted to this faculty, as one description of it, while it conceives, examines, or discovers resemblances, or agreements among the objects of contemplation, which the bulk of men do not observe, conducts us first to conjectures, and at last by assistance of the judgment, to true science. Perhaps we are as really indebted to it for a *Newton* as for a *Homer*.

287. Imagination and memory have this in common, that they exert their power over the perceptions of sight and hearing only. In fact, they cannot renew with correctness or force the perceptions of the other external senses.

288. Judgment is that faculty by which we contemplate our perceptions, and conceptions of every description; of sense, of memory, or imagination; by it we compare them; discover their resemblances and differences; and thence deduce various conclusions. This faculty is feeble in infancy and boyhood. In the vigorous period of life it is more decided and correct, and is gradually depraved by age, and by all those diseases which impair the memory; for without memory there can be no exercise of judgment.

289. All these faculties belong so entirely to mind, that at first glance there would seem to be nothing corporeal in them; the diseases, however, which obstruct them, prove that a certain state of the brain is requisite to their proper exercise, and that it is the primary organ of the internal senses. Nor are there wanting philosophers, and medical men of considerable celebrity, who deny, that any change or conception

takes place in the mind, unaccompanied with a definite and corresponding change in the brain. The matter is rather uncertain, of little utility, and not easily brought to the test of experiment (120, &c.) So far from having any knowledge of the changes which take place in he brain, or of the manner in which its various parts operate during the exercise of memory, imagination, or judgment, we have not hitherto been favoured even with a plausible conjecture on these subjects.

290. Of this function, then, the reason of which even in health is involved in such deep obscurity, the diseases cannot be well understood; yet it has it's peculiar diseases, severe, troublesome, deplorable, and worthy of all attention; disorders, which render useless that very mind by which we excel the other animals.

291. The mind is deranged, when one confounds the objects of memory, or imagination, with the perceptions of the external senses, and thus ascribes existence to things which neither did nor do exist; or when one's judgment of things is perverted, and foreign from the common sense of mankind. But this seldom or never happens. A deranged person usually judges rationally, though from false premises. It is not bad reasoning, but deception rather from derangement; when the man who believes himself to be Jupiter, claims Jupiter's thunder.

292. The general term vesania, is used to denote derangement; if it arise from fever, it is termed delirium; if, without fever, the affection be general, it is insania; if it is less general, and confined to one or two objects, while the mind is sound on other topics, it is called melancholy, which is sometimes combined with uncommon sadness. Yet no line of distinction can be accurately drawn between soundness of mind and vesania. All unusual cheerfulness verges to insania; and a sorrowful and fearful mind approaches to melancholy.

293. Delirium of various kinds attends fevers; sometimes it is light, going easily off, and not at all an unfavourable prognostic: often, however, it is severe, a very bad sign, and requires great care and attention.

294. Delirium is either denominated furious or mild. The former is preceded and accompanied by redness of the face, pain of the head, throbbing of the arteries; ringing of the ears, eyes red, inflamed, menacing, flashing, impatient of light; either no sleep, or the rest frightful and broken by horrible dreams; manners entirely changed; instead of gentleness, moroseness, intractableness, and passion; derangement at first observable between sleeping and waking; imaginations believed as realities; perceptions from external senses, either none at all or neglected; and the stores of memory produced without any order: in a word, by rage, and, in some cases, an unusual and incredible strength of limbs, so that many people can scarce restrain one patient.

295. On the other hand, mild delirium is often observed attended with a feeble pulse, a shrunk pallid countenance, with vertigo in an erect posture, and prostration of strength. It is also attended with head-ach, but not so acute as in the other case; seldom with anger; often with stupor; on some occasions with much grief and terror. The derangement is first observed when the patient is half asleep, which is sometimes removed by the admission of light, and conversation of friends; the patient mutters a great deal to himself; pays little attention to what is doing about him; at last, becoming stupid, he neither feels hunger, the thirst by which his throat is parched, nor his usual propensities; whence the urine and fæces are voided involuntarily. In the progress of the disease, it terminates in starting of the tendons, tremors, convulsions, faintings, and death. The other kind of delirium, too, when the patient's strength becomes exhausted, often subsides into this.

296. The symptoms attendant on both diseases, shew an unusual, irregular, and unequal motion of the blood through the brain, a state of it which must be changed in order to soundness of mind. It is probable, that, though the general symptoms of inflammation in the body are but slight, inflammation of the brain, in whole

or in part, is sometimes present in a greater or less degree. Dissections prove this, and have often shewed an unusual redness of the whole brain, or a part of it, and effusion, suppuration, &c. within the head.

297. But the state of the brain may be much affected, and delirium induced by other causes beside the circulation. In many fevers, such as those which are attended from the beginning with great debility, the nervous system is more early and more severely affected than the circulation, and there are many disorders of the former, which, like its healthy actions, are not obvious to the senses. But many symptoms of injury shew plainly, that its action, or excitement, as many call it, has become unequal and irregular. The same account is to be given of that delirium which arises from poisons.

298. From these remarks, though they do not fully explain the subject, it will in so far appear, why delirium varies in kind, in violence, or in prognostic; why it is frequently increased by motion, light, noise, affections of the mind, stimulating medicines, or by heat; why it is cured in one case by venesection, and slender diet, in another by wine and stimulants; why it is sometimes alleviated or repressed, by the sight and conversation of friends and bystanders, and by the view of well known objects; why it is often aggravated when the patient is kept in bed, and becomes milder when he rises and sits for a little erect.

299. A still deeper obscurity involves the cause of melancholy and insania, in those cases at least which are not attended with fever, or any disturbance in the circulation; which are frequently hereditary, or depending, as it would appear, on the first and congenital structure of the body, especially of the brain, the disorder of which, nevertheless, cannot be discovered by the most discerning anatomist, often recurring after long intervals, during which, the person seems to enjoy both soundness of mind, and health of body, and which, in fine, frequently arises from depressing affections, those mental diseases, the injurious effects of

which on the brain, and the manner in which these are produced, being utterly unknown.

300. It is, however, well known, that various disorders of the brain, such as obstructions, tumours of the brain, or of the skull pressing on it, contusions on the head, and, as medical writers allege, the hardness or dryness of the brain itself, and certain provocatives stimulating the nervous system, induce the disease. And, in fact, such is the irritation of persons under derangement, that in many instances, for a long period, they sleep little or none, nor can they easily be induced to sleep by the usual remedies.

301. But this knowledge of the diseases of the brain, and of the mind, scanty and imperfect as it is, does not want it's difficulties: for, on occasion of the brain, or any part of it sustaining an injury, by tumour, by the irritation of a pointed ossification, &c. no person can foretel what disorder such injury will produce; whether *epilepsy*, *apoplexy*, *hemiplegia*, stupor, melancholy, insania, headach, or perhaps nothing unusual. For there have been instances of men who, after losing no small portion of the brain, have recovered, and lived a long time; and others, a great part of whose brain had been depraved, have felt no inconvenience, till at last they sunk at once and died in convulsions.

302. There remains yet another disorder of the internal senses, entirely different from these, namely, fatuity. They are fatuous who possess no judgment, and who either have no memory, or it is inadequate to the duties of life. There is a certain fatuity, not a disease, which is natural and common to all infants; but if it remain beyond infancy, it then becomes a disease, and a severe one, for the most part incurable. Fatuity proceeds from causes similar to those which produce the other disorders of the internal senses, as far as these can be discovered by the eye, or the dissecting knife. It is observed to be a frequent attendant and effect of epilepsy. If this derive it's origin from causes external to the head, suppose from worms lodged in the intestines; when the worms are expelled, and the epilepsy cured,

the fatuity is sometimes cured also by an accession of understanding.

303. It is not improbable that the fatuity of infants, and that defect of memory, and of course of judgment too, which take place in the aged, arise from the state of the brain, in the latter too hard and rigid, and in the former soft to excess.

CHAP. XI.

Of muscular motion.

304. THAT state of the muscles, by which their fibres contract themselves on the application of a stimulus, is called irritability.

305. Stimuli are various: in the first place, every thing mechanically sharp, whatever punctures, cuts, pulls, lacerates, or distends, excites the fibres of the muscles to contraction; again, many substances chemically sharp, or pungent, derived from animals, vegetables, and fossils; also cold, heat, and the electric spark: to these, in a word, must be added many states or actions of the mind, to which we shall afterwards attend.

306. Some of these stimuli, particularly distention, appear to affect those parts, which for distinction's sake, are called mortua, (76, &c.) and to induce some degree of contraction in them. But the contraction of these differs widely from that of which we are now treating, being trifling in degree, slow, and constant, and not effected until the distending power has been withdrawn, which it was not able to overcome.

307. But the contraction of the muscles is sudden, and very powerful, often greater than the distending force, which it sometimes overcomes; and farther, is attended with an alternate relaxation. It is easy then to distinguish that irritability which is peculiar to the muscular fibres, from that power of contraction, which, in greater or less perfection, all the solid parts of animal bodies possess.

308. The reason of muscular contraction, so long the object of eager and fruitless inquiry, is yet unknown.

But when attentively observed in a bundle of fibres cut out of a body, it operates in this manner: the whole trembles, becomes shorter, thicker, harder, wrinkled, and sometimes pale, while the muscle contracts; then it is relaxed, and again becomes plain, smooth, soft and long; and in short repeats it's contraction.

309. But the muscles are far from acting in the same manner at all times in the living and sound body. For the long muscles of the trunk of the body, and of the limbs, are not only contracted at pleasure, but remain long contracted; although, in fact, if left to themselves, they would be relaxed in a short time. Again, the hollow muscles, that is, the fibres, which wind themselves around the hollow organs of the body, cannot exhibit their relaxation; as in the heart, arteries, intestines, and bladder; although the functions of these parts also, when well understood, demonstrate that relaxation alternately succeeds contraction. Lastly, it would appear that those muscles, which shut the apertures to which they are affixed, and which are commonly denominated sphincters, are never completely relaxed in a healthy person.

310. From a thorough inspection of the fabric, the situations and terminations of the different muscles, and of their union and connexion with other parts, their various actions, and various uses in the system, will be easily understood. It will at the same time be evident that all the actions to which they are subservient, are accomplished by their common motion, either by simple contraction, or by the repetition of this, joined with alternate relaxation. Thus, while a long muscle acts, the parts connected by it must approximate; the hollow muscle again must become constricted, and propel it's contents in that direction which remains free; and the sphincter shuts up that passage over which it is placed. These in fact are the uses of the muscles.

311. Muscles commonly terminate in a substance which, compared with the size of the muscle itself, is slender, but of a texture firm, strong and bright, which the ancients denominated nerve, but which later writers

have called tendon, to distinguish it from another kind of nerves (110.) Such conformation of the muscular parts seems evidently to have been adopted by the great Author, with this design, that, with the greater ease and elegance, they may be knit to the bones, or other parts necessary; and that a greater number of muscles being inserted in the requisite points of the bones, might give motion and direction to the limbs and to the whole body in the best manner possible. But the tendon does not act at all, and may be accounted a cord in a machine; by which the motions of some one part are communicated to others, and those more remote.

312. It has been long and eagerly debated, whether the size of the muscle were increased or diminished during contraction. The difference, if any, is so trifling, that it can neither be easily reduced to measure, nor is it yet ascertained of what nature it is.

313. The muscles act with a great and almost incredible force. This is evident from the vast weights which they raise, though the whole power of the fibres is far from being aptly expended on the production of that motion;—in the first place, because the *tendon* is inserted very near the centre of motion, and has a very oblique direction; and also, because the several fibres, which are collected to form bundles, and even these bundles themselves, have a direction very oblique to the line of direction of the *tendon;* by which it happens that a great part of the power, acting in a direction so oblique, and almost opposite, destroys itself. Calculating from these premises, the result is an enormous power of the muscles, the double of which must still be assumed as the power which a muscle can exert or sustain; because all such action is reciprocal, and the muscle, of course, is drawn towards it's own origin, with a power equal to that with which it draws the part into which it is inserted. When a muscle is cut out of the body, even a twentieth part of such force would break and pull it in pieces. If, then, there has been no error in calculation, the vital power of the muscles must be astonishing.

314. And, indeed, nature seems not to have attended so much to the waste of power, as to the elegance and shape of the body, so very beautifully accommodated to all it's movements.

315. The extent, also, of the contraction of a muscle is considerable, but varying in different parts. Some muscles are shortened by a fourth part; others are contracted to a fourth part, in some animals even to a tenth part of their former length.

316. The contractions of muscles are performed and repeated with incredible velocity. This is evident from races, especially of quadrupeds; or from the action of the tongue, which can express four hundred words, perhaps two thousand letters, in the space of a minute, though many of the letters require each a great many muscular contractions.

317. Some muscles are set in motion with ease, others with difficulty; the case differing, both in different persons, and in the same person at different periods.

318. Again, the same things which most violently stimulate some muscles to motion, have little effect on others.

319. Philosophers who have studied muscular motion, have supposed that they had discovered various sources from which their astonishing power might be derived, reasoning sometimes with more subtilty than truth, about a matter sufficiently simple.

320. Muscles evidently possess, in common with every part of animal solid, no small portion of elasticity, which remains even after death; but whatever additional motion they possess, depends entirely on life, and on the connexion subsisting between them and the brain and nerves.

321. Next after this simple elastic power, what is called the *tonic* power of the muscles, deserves attention. Distention itself is a stimulus which operates upon every muscle; (305, 306.) and almost all the muscles of the living individual are more or less dis-

tended beyond their natural state, which they would assume, if left to themselves.

322. Such distention is occasioned by the growth of the bones to which they are attached; by the action of the opposite antagonist muscles; by the weight of particular parts which the muscles sustain; and from the fulness of the hollow organs or viscera which they envelope, or to which they are in any way attached.

323. An increase of distention increases the *tonic* power, and with it the vigour of muscular action; it's diminution has the contrary effect. This accounts for the action of plethora in quickening the circulation: it shews also the propriety of blood-letting in many diseases; since there cannot be a more certain or speedy expedient for reducing the impetus of the blood.

324. But this *tonic* power, so far as it depends on distention, has it's limits, and these sufficiently confined; for a great and lasting distention of muscular fibres, so far from rendering their contraction more easy and powerful, often diminishes or destroys it; thus the muscles are relaxed, and do not easily or speedily recover their former vigour.

325. Again, a muscle, no way unusually distended, contracts on the application of any stimulus. To this property of muscles, medical men have given the name of *Vis insita.*

326. Supposing no application be made to the muscle, if the stimulus be applied to the nerve which is distributed on it, similar motions are excited. Or, when the brain itself is irritated, the greater part, or the whole of the muscles, will be convulsed. This condition of the muscles is called the *nervous energy*, differing only in seat from the *vis insita.*

327. Lastly, without applying any stimulus to the muscles, nerves, or brain, we may, by volition alone, excite the greater number of muscles to contract: this is properly called animal power, and is competent to animals alone.

328. All the muscles, however, are not under the controul of the will: and many actions of the greatest

moment are performed without the person's knowledge or consent, or even in spite of his resistance. Hence muscular motion is either voluntary or involuntary.

329. The motions of all the muscles of the head, of the face, of the eyes, and of the mouth, (as far as the *pharynx,)* of the neck, of the trunk, and of the limbs, in a healthy person, are voluntary, and may be excited by the will alone ; though sometimes, without the presence of disease, these muscles may be contracted without his knowledge or consent.

330. The involuntary motions are those of the heart, of the arteries, of the organs of secretion, of the whole intestinal canal, from the pharynx to the anus ; of the pupil of the eye, and of the other sphincters (though we have indeed some degree of controul over the most of these,) of the urinary passages, of the bladder, of the uterus, and of the bronchia.

331. The muscles subservient to respiration hold a kind of intermediate place between these two classes. These are the diaphragm, the muscles of the abdomen, the intercostals, together with all those which are so connected with the ribs, that their contraction serves to hold them steady, to elevate, or depress them.

332. It is scarcely, if at all credible, that those powers should be easily confounded which nature made distinct ; and that a person in sound health should ever have lost the controul over voluntary motions, or acquired it over the involuntary.

333. The motions which are performed, independently of volition, are severally excited by some stimulus, either applied to the muscles themselves, or to some sentient part sympathising with them, at whatever distance, by nervous consent ; or affecting either the brain or the mind itself ; whence, according to the original and congenital structure and constitution of the body, certain parts only are affected and excited to motion.

334. The provident Parent of all things seems, therefore, to have applied the necessary stimuli to those organs, the actions of which were absolutely necessary to sustain life, to refresh the body, or to the exercise of

certain functions of life. He has given man a partial controul over those organs, which partly perform some vital function, and are partly subservient to other less important and temporary offices: the rest he has subjected to his complete controul.

335. Of his voluntary motions man is conscious: not perhaps of every muscle which lends it's aid, but of the volition and effort, and of the motion of the whole limb, provided the attention is directed to it. By long habit that sensation is enfeebled, but never entirely destroyed.

336. On the contrary, the involuntary motions are perceived with difficulty; and, in a healthy state of the body, they are altogether imperceptible. But when they are violent, imperfect, irregular, performed with difficulty, or obstructed, in that case certain uneasy sensations, as pain or anxiety, are produced.

337. The intermediate motions, namely, those pertaining to respiration, when left to their natural course, are little felt: but, if attention be given, they may be perceived. When of choice they are exercised in an unusual manner, the sensation is then much stronger: when they are impeded, they oppress the unhappy patient with great anxiety. (186, &c.)

338. By legitimate and vigorous exercise, provided it be not excessive, the muscles of voluntary motion acquire additional firmness, mobility, and strength, and become more brawny: hence we are accustomed to form a judgment of a person's strength from his very shape. This fact is well understood by sculptors, who, in expressing the muscles of a Hercules, an Apollo, and a Venus, know how to give an appropriate configuration to each.

339. The strength and mobility of single muscles are increased by use: the combination also of a number of muscles, which concur to produce the same movement, being often repeated, becomes by habit more easy, prompt, and accurate.

340. When the motions, however, are violent, unusual, difficult, or of long continuance, the strength be-

comes exhausted, and the person fatigued. His actions of every description become more feeble, uncertain, and tremulous; a peculiar kind of unpleasant feeling, then pain, afterwards rigidity, invade the limbs employed, debility and languor, the whole body; all which powerfully invite to rest and sleep. When no intermission of his labours is permitted, a great and universal failure of strength, and sometimes sudden faintings, or at last death itself, puts an end to them.

341. The contrary takes place in respect of the muscles of involuntary motion, which neither acquire additional strength by exercise, seeing they always serve the same purpose in the healthy body, nor can be fatigued with any exercise. The heart itself, the most powerful muscle, daily makes one hundred thousand pulsations, and is no way fatigued after eighty years activity. But after violent, unusual, or irregular action, even the muscles of involuntary motion sometimes become enfeebled, but never with the sensation of fatigue.

342. In a word the muscles of respiration, when left to their usual course, are not liable to fatigue; but like those of voluntary motion, they readily become so, when under the direction of the will; so that they are no longer adequate to any unusual action. But a sensation of fatigue is scarcely perceptible.

343. Farther, the muscles of voluntary motion themselves, even in the most healthy person, sometimes obey other stimuli; stimuli, which suddenly hurry him on, conscious, unconscious or reluctant, with vast and irresistible force; or, in a more mild and engaging manner, invite, allure, and draw him by a fine and imperceptible thread.

344. Among these stimuli the affections of the mind hold a distinguished place; anger, joy, grief, fear, love and hatred, excite certain motions in the muscles, especially in those of the face; whence they express themselves in the countenance, with an accuracy which the art of the sculptor can but faintly imitate. When lasting, violent, and often repeated, the expression of them becomes more deep and constant, and cannot be

erased but with the greatest difficulty: hence, there is often an expression of passion when the mind is under no present influence of anger. On this foundation rests the art of the physiognomist. Other muscles, too, beside those of the countenance, are excited to motion by the same means, so that a person may express many affections of the mind, in the body, the gesture, and the voice. These affections also exercise a powerful influence on the muscles of involuntary motion; on the heart, arteries, organs of secretion, stomach and intestines, and on the muscles of respiration; the consequences of such influence are, an accelerated, debilitated, or irregular circulation, disorder of the secretions and digestion, and an unnusual state of respiration.

345. The affections of the mind are properly distinguished into those that elevate, and those that depress; that is, those which increase the vital powers, or those that diminish them. To the first class belong anger and joy; to the latter, grief and fear: Some affections are mixed, or of dubious character, referable sometimes to the one class, sometimes to the other; such as love, which either elevates or depresses the spirits, according to it's success or disappointment. On some occasions also, great and sudden terror operates as an elevating affection, and impels one to rapid and violent movements.

346. But from both kinds of mental affections, danger may arise; they are therefore deservedly ranked among the causes of disease. (61.) When they produce violent excitement, life is sometimes extinguished by their first effects on the nervous system: when they are less intense, they become noxious by vitiating the motion of the fluids. Those which depress the spirits, debilitate the whole man; disqualifying him for all the vital, natural, or animal functions: whence proceed lingering illness, and often incurable diseases.

347. Another cause of animal motion, and no trifling one, and perhaps deserving notice here, is curiosity. This impels man, always with consciousness, but almost unintentionally, to contemplate and investigate new and unknown objects. In the infant it is very power-

ful, and of the greatest utility, inciting him to exercise his organs and learn their uses; and thus, without a teacher, he learns much, and in a more agreeable and accurate manner than he could have learned from the best master. Besides, in this way, the infant with his own hands lays the foundation of his future knowledge. In an adult, curiosity is often found diminished; in decrepid old age, it is nearly extinct. By certain enjoyment, as wish a premium, nature allures man to the due exercise of his organs, both of sense and motion; both that these may be strengthened, and that he may in the mean time learn many things which are interesting to him. By this stimulus too, he is impelled, by this premium he is invited to the pursuit of those objects which are more remote, and which are covered with a dense cloud; till at last he penetrates, with the mental eye, many subjects which nature denies to corporeal vision.

348. Farther, we learn and practise many things by imitation alone. The yet unconscious infant, imitates whatever he sees or hears; and the adult, exercising his own discretion, is yet unconsciously and unintentionally so much under the influence of this propensity, that he acquires, though often against his wish, the manners and accent of the persons with whom he converses. An infant acquires language entirely by imitation; otherwise, as certain philosophers have supposed, he would be as dumb and debased as the brutes around him.

349. Somewhat allied to this, is that other sudden and more violent imitation, which, like the paroxysm of insanity, sometimes hurries along with it, not individuals only, but whole societies. By this, as by contagion, the various affections of the mind, whether sorrowful, joyous, or humorous, beaming from the countenance of one, pervade the breasts of all. The ardour of battle and confidence of victory, as already certain, caught from the animated countenance of a commander in whom the soldiers confide, has in a moment pervaded the whole field, and equally inflamed many thousand hearts; but the same soldiers, after victory, panic-

struck, through the terror of one man, perhaps of a stranger, have turned their backs with disgrace, not by any means to be retained or rallied.

350. The enthusiasm of some fanatics has also, on some occasions, diffused itself in a similar manner; and men who thought themselves sound, and despised and ridiculed such madmen, have themselves, merely from seeing and hearing them, been hurried away by their phrenzy.

351. Analagous to these, are certain affections of the nervous system; such as yawning, hysteria, or epilepsy, which, by sight alone, are often propagated in an astonishing manner.

352. Instinct, as it is termed, is also a cause of motion; in other animals, a remarkable one, and of considerable importance in man himself. Instructed by this teacher, the stranger newly arrived in this world seeks the mother's breast, catches the nipple in his mouth, and, by employing the combined operation of many muscles, commences the action of sucking, an action which an adult person finds it difficult to imitate. He also knows how to direct, and to turn to the same object both eyes, though moved by muscles entirely distinct, and which are furnished with different nerves.

353. To instinct also belong various appetites, by the operation of which, man is impelled to refresh his body, and to propagate his species; hunger, therefore, thirst, and desire, excite motions directed to certain ends. There are sometimes other definite desires, both morbid and salutary, which are justly classed among appetites; such as the desire and longing for absorbents, acescents, vegetables, salted meats, aromatics, and the like.

354. A great number of propensities attach both to the healthy and morbid state of the body, and produce a variety of motions, the greater part attended with consciousness; such are those that tend to the discharge by stool or urine; to coughing, sneezing, yawning, stretching of the limbs, and vomiting. If the propensity be of the slighter degrees, we employ the controul

of the will to repress the natural motions which it usually excites; but if it be rather powerful, we cannot prevent it from effecting these movements.

355. While many wonderful motions take place in the body, from so many causes, their number is still farther increased, and they are often the less understood, because the parts themselves are moved, while the stimulus, be what it may, is not applied to these but to other remote parts. This is commonly called consent or nervous sympathy; the knowledge of which is of the first utility to a physician, both for distinguishing and curing diseases.

356. The whole body is one machine, the several parts of which, and their various actions, combine to produce a certain result. Some parts of it perform a duty peculiar to themselves, but the far greater number have a function in common with other parts; neither can certain parts be affected, without the whole machine participating in the same affection, and undergoing important changes. Hence arises that general consent by which all the parts of the body are governed: and hence that special consent, by which parts which have a common function mutually affect one another, while the rest of the body undergoes little or no change.

357. A general consent is observed between the brain and the whole nervous system, and of course between the brain and the whole body; which indeed, need not surprise us, seeing all it's power is derived from the brain. Farther, there subsists a consent nearly as general between the stomach and the whole nervous system: even the skin itself, with the cellular membrane, so richly furnished with vessels and nerves, has so great a sympathy with the other parts of the body, that a very small portion of it being affected in a certain way, the whole is affected, and induces astonishing changes in remote parts of the body, as in the stomach, the kidneys, and the whole nervous system.

358. Of special consent there are many instances: as, between the two eyes, between the retina and the muscle of the pupil of the same eye; between the ute-

rus and the breasts; between the lungs and the diaphragm; between the fauces and the stomach; between the several parts of the intestines; and between the stomach or rectum, and the abdominal muscles and diaphragm.

359. Some consents or sympathies are natural, and others diseased; the former are observed in the healthy body, conducing, or absolutely necessary to the functions of life and health; the latter do not shew themselves but when the disease is present, of which they are a symptom and a part. Of the latter description, are those observed between the kidneys and stomach; between the nostrils or larynx and diaphragm; and between the feet and the stomach, in the stone, the gout, hysteria or catarrh.

360. Lastly, some sympathies, never observed in health, and not common in disease, have been observed in certain cases; as the trismus from a wound, possibly a very slight one; or some very rarely observed, as the pain and heat of the soles of the feet, from an ulcer in the bladder; or an intolerable and even fatal pain of the arm, during the discharge of urine.

361. Of these things, the cause is involved in some obscurity, and a full explanation of them has not yet been given. It deserves notice, however, that, for the most part, sympathies, whether general or special, depend on the connexion which every part of the body has with the brain; and that this last, being affected in a certain way by any particular stimulus, wheresoever it may have been applied, either changes the state of the whole nervous system, or excites motion in certain parts, rather than in others. For, when the nerve of either of the consenting parts is cut, compressed, obstructed, or in any way hurt, or when, in a word, the brain itself is much injured, there is no sympathy, though the parts themselves, on the application of the stimulus, still shew that they retain their irritability undiminished.

362. Some sympathies, of both classes, arise from the contiguity of the parts, the connexion of blood-vessels

or nerves, or the extension of the retiform membrane from the one to the other. Such are those of the whole of the skin; of the adnata with the retina, and other internal parts of the eye; of the rectum with the bladder and uterus; and of the bladder with the orifice of the urethra. It must, however, be acknowledged, that the sympathies observed between distant parts, very seldom admit of this mode of explication; and that much labour has been lost by many who, with great industry and ability, have laboured to discover even the minutest combinations of the arteries and nerves of the consenting parts.

363. Some uncommon and morbid sympathies, seem to arise from extraordinary sensibility, irritability, and weakness of the part, rendering it more liable to be affected by the state, the disorders, and excitements of other parts. This seems to be the reason, why many diseases proceeding from a general cause, attack with more ease, those parts which are already debilitated and disposed to disease.

364. In fine, there are numerous motions excited in the body, when in health, much more when in a morbid state, which, beyond expectation, remove many inconveniences, dangers, and disorders, which avert or expel diseases already formed; and thus, for a long time, preserve the whole machine in a sound state.—(65. &c.)

365. The question is not yet decided, what is the nature of this autocrateia, and the extent of it's powers; whether those salutary motions are to be referred to the general laws of animal motion; or whether the animal machine itself has a specific and definite power of guarding against injury, and of exciting such motions as are requisite to that end.

366. It is very certain, that many things which naturally tend to allay and repress motion, sometimes excite motions the most powerful and salutary. This, however, does not set the question at rest; because, according to the common laws of animal motion, which are sufficiently manifest, many causes of that descrip-

tion, may give a stimulus of considerable force in different ways, according to the various conditions of the body, and the several parts that are affected. This effect often attends debility itself, or whatever obstructs the usual action of the organs.

367. There have been medical men of no small celebrity who have referred all such motions to the mind itself, which judged concerning impending danger, and how it was to be removed; and therefore excited such motions as it believed most adapted to that end.

368. No observer of nature will be so unreasonable as to deny that she often excites many motions of the most salutary tendency, and which are therefore to be imitated and promoted by practitioners as far as possible; but no one who believes his own eyes, can avoid seeing that a great number of them are useless, excessive or noxious, and that physicians must of course allay, repress, and moderate them, that they may rescue the patient from a double danger. But, granting that all those motions were directed by the greatest judgment and wisdom, as doubtless some of them are, that could be no reason for referring them to the action of the mind, seeing they have no dependence upon it; for the most part, the mind is not conscious of them; it neither can excite them at pleasure, nor when they are excited by any other cause, can it impede or govern them; in a word, these motions may take equal effect in the most stupid of mankind, or in the brute, unconscious alike of the disorder, and of the remedy, as in the most discerning and skilful philosopher or physician. Let medical men learn, in the meantime, what good is to be expected, and what evil is to be dreaded, from powers which exercise so extensive an influence over the system; as to the mode in which they are effected, though hitherto involved in obscurity, time unquestionably will sooner or later bring it to light.

369. All those motions more strictly termed animal which depend on the will, with those vital and natural motions over which we have a partial controul, are to a surprising degree regulated by habit; on this chiefly

depend their force, velocity, order, time, recurrence, and attendant sensations. Motions difficult at first, which cannot be effected without a distressing sensation, and those entirely voluntary, being often repeated, come to be effected with greater promptitude and facility; and then take place almost without one's knowledge, or, at least, attention. When left to themselves, they occur in a certain order, which has become habitual, and sometimes cannot be effected in any other. Muscles acquire greater force and velocity of motion, by exercise, for the reasons assigned (338, 339.) Some stimuli, and the motions depending on them, which were accustomed to recur at uncertain intervals, are by habit reduced to stated times; as appetite for food, propensity to the common evacuations, and the like. New appetites are also acquired by habit, and which cannot be relinquished without difficulty; such as the appetite for wine, tea, coffee, tobacco, and many things which, so far from being naturally desirable, were at first unpleasant and almost insupportable. In the same way is the fact accounted for, that long habit makes it necessary to have many stimuli more powerful than nature at first required. The consequence is, that man has, as it were, the power of changing himself in a very great degree at his pleasure, and of fabricating himself anew; a matter of great utility to practitioners, for correcting certain disorders of the constitution, and preventing many diseases; provided due care be taken that the change desired and attempted, be induced in a gentle and prudent manner.

CHAP. XII.

Of the disorders of muscular motion ; of excessive irritability, torpor, palsy, and spasm.

370. THOSE powers (304, &c.) whence muscular motion arises, are subject to many disorders, which deserve the more attention, that the greater number of diseases of the system depend on them ; so far as some portion of muscular motion is required to all the functions of the living animal.

371. Irritability itself may be excessive. We must carefully distinguish between this and vigour. Irritability is the facility with which the muscular fibres are excited to contraction : vigour, on the other hand, is the force with which their contraction is made. These two are sometimes observed combined, but more frequently in opposition, and are in general owing to different causes.

372. Irritability is excessive whenever motions are excited by too slight a stimulus, or excessive motion from an ordinary stimulus ; when this happens the motions also are commonly irregular.

373. A certain temperament of body, sometimes a hereditary one, renders persons liable to be thus affected. Women are more so than men. In the first stage of life irritability is great, sometimes in excess ; in youth it is less than in infancy, but greater than in the vigour of life ; in old age it is often defective. An indolent, or sedentary course of life, full or luxurious diet, suppression of the usual secretions, or sometimes sudden evacuation of them, laxity or flabbiness of the solids ; sometimes also, the excessive tension of the moving fibres, the use of diluents, especially warm ones, heat in

whatever way it may be applied, and too acute sensation, all tend to render the irritability excessive.

374. The excess may be either general or topical, according as it's causes affect either the whole, or a particular part of the body.

375. Vigour, when universal, is seldom a disease: it is however sometimes found excessive in certain muscular parts in comparison of others. In deranged and phrenitic patients, we see a great power in all the muscles, particularly those subject to the will, and it is justly accounted a disease. The reason of such excess is somewhat obscure, but is evidently referable to a disordered state of the brain.

376. An excess of vigour, of more frequent occurrence, and of greater importance, is observed in the fibres of the involuntary muscles, especially in those subservient to the motion of the blood. The circulation of this is often rendered preternaturally intense, not without serious inconvenience or danger both to health and life. A slighter excess of this kind pervading the whole system, renders persons liable to inflammatory diseases, and, by medical men, is termed an inflammatory diathesis; but it is more severe and topical in actual inflammation.

377. Excessive vigour of the muscular fibres may arise, either from the increase of the nervous energy (326.) beyond it's due measure, as in phrenitis, insania, or vehement affection of the mind, or from too great tension of the fibres (320.4.) whereby they are set in motion with the greater ease and force, as in the distention of the arteries by an abundance of blood producing plethora; or perhaps from cold, or heat succeeding cold, as usually happens in the spring; or, in fine, from the application of extraordinary stimuli to the muscles, while the nervous power and tension of the fibres are in a sound state (385, &c.), or of an ordinary stimulus, when the fibres themselves have been previously rendered too irritable, (371, &c.)

378. From these considerations we may understand both the good and bad effects of many things, and the action of many remedies which we employ for exciting,

moderating, and directing the force and motion of the moving fibres; as, of a slender and nourishing diet, wine, opium, stimulants, and certain evacuants.

379. Of contrary disorders, torpor is opposed to excessive irritability, debility to excess of vigour. Torpor is expressive of the diminution of irritability, when it is inadequate to the due exercise of the functions of life. It proceeds from causes contrary to those of excessive irritability; particularly from the state of the solid parts when too hard and rigid, sometimes too lax and flaccid; to advanced age; from peculiar temperament, phlegmatic, cold, or of little sensibility; from incessant or excessive labour; from cold, slender diet, or an exhausted body. This disorder is the more to be dreaded, and the more difficult of cure, that the usual powers of nature being wasted, the body is inadequate to any effort, and medicines have little effect, though otherwise very powerful.

380. Debility or weakness is accounted a disorder, when the motions of the muscles, either of the voluntary or involuntary, are not performed with the just degree of force. It is greater or less, general or partial; and accompanies almost all diseases, of which it forms no small part. It also renders the body obnoxious to innumerable diseases, exposing it to them without defence: It often depends on the original, and congenital conformation of the body, and cannot be completely corrected by any remedies, or by any mode of living. The power and strength also of the body, varies in different periods of life, and that which a person in the flower of age could perform with ease, or endure with impunity, would oppress or kill the boy, or the old man. There is often weakness, therefore, without disease, but debility becomes excessive and a real disease, from the diminution of the nervous energy, (326.) owing to a diseased state of the brain and nerves, in which disorders the muscles participate; from the peculiar disorders of the muscles themselves, the due tension (321, 2.) of the fibres being destroyed, either by their excessive or protracted distention, (324.) or their rigidity and torpor;

from an exhausted body, too sparing diet, abstinence, or evacuations; in a word, from diseases affecting either the whole body or particular parts.

381. The highest degree of debility, in which the muscular power is almost or utterly destroyed, is called palsy. It is either general, or an affection of particular muscles only. When general, it proceeds from disorders of the brain and nerves, which sometimes are not clearly discerned, and which cannot be discovered by the dissecting knife; as when the nervous energy fails, while the structure of the organs remains entire; on many occasions, however, compression, obstruction, laesion, effusion of blood, serum, or pus, tumour, or the like are detected. It frequently proceeds from certain poisons producing disorders of the nerves; from the fumes of certain metals, as mercury, lead, &c.; sometimes from diseases of parts very remote from the brain, and the muscles paralysed, as in colica Pictonum. Oftimes, while the brain and nerves are unhurt, imperfect paralysis of particular muscles takes place, owing to severe and lasting pain, inflammation too violent, or protracted tension (324); to relaxation, rest, or to the depraved structure of the muscles, such as commonly happens after rheumatism, gout, dislocation, fracture, or suppression of urine in the bladder.

382. But palsy, which is accounted general, and which proceeds from disorder of the brain, seldom extends to the whole body. We see the most part of paralytic patients seized on the one side. This is called hemiplegia. It is alleged, and indeed confirmed by the observations of a great many medical men, that the side opposite to that in which the brain has been injured, is thus paralysed. Sometimes, too, when one side of the brain has been injured, the same side of the body is agitated, and the opposite side paralysed. When all the parts below the head, or below the loins are paralysed, it is termed paraplegia. In palsy, the feeling for the most part remains; it is sometimes destroyed; frequently rendered obtuse. The worst case of all is when the arteries themselves become paralytic; then the mo-

tion, the feeling, the pulse, and warmth of the limbs, which are paralysed, all perish at once: this, however, happens but seldom. Palsy affecting the voluntary motions of the whole body, producing anaesthesia (173.) and drowsiness, is called apoplexy. This proceeds from laesion of the brain. A state very similar to this is brought on by narcotics, by opium, by wine, or other generous liquor taken to excess; in fine, by inhaling air impregnated with carbonic acid.

383. There remains to be noticed another disorder of muscular motion, neither slight, nor of rare occurrence, termed spasm. This is a violent, irregular action of the muscles. It is distinguished into two kinds, the tonic and clonic. The latter is often called convulsion, to distinguish it from the former, to which alone the name spasm is commonly given.

384. Spasm, then, is a violent, constant, irregular contraction of the muscular fibres; convulsion, again, is an unusual, violent contraction, with alternate relaxation. In either case, if the voluntary muscles be affected, the motions take place involuntarily; but the affection is one and the same, whether it attack the voluntary or involuntary muscles. Farther, both species of this disease arise from similar causes; both are often observed in the same patient, and the one is frequently converted into the other.

385. A too sensible (143.) and too irritable (371. 4.) habit of body, renders persons obnoxious to spasms: hence the disorder is familiar to women, to children, to the enfeebled, the luxurious, the indolent, and plethoric.

386. It is induced, on persons predisposed to it, by the application of any stimulus (305.) to the brain, the nerve, the muscle, or to some sympathising part. (325, 26, 55, &c.) The stimuli are such as the following: dentition; worms lodged in the intestines, and irritating the acrid matter infecting the blood, or oppressing the stomach or bowels; irritation of a nerve, or of the brain, by the pressure of a preternatural excresence of bone, by tumour, or by a plethoric state of the blood-

vessels; pain, violent passion, sudden evacuation, and certain poisons taken into the system. Often, however, the disorder, becoming aggravated by habit, (369.) is excited by slighter causes, which are but little known, and not easily observed.

387. Spasm is the cause and the effect of many diseases, and sometimes forms the principal part of them. It is, on some occasions, equally difficult to discern and to cure; seeing it puts on so many shapes, and exhibits such various symptoms, according as it affects different parts of the body, the functions of which it disturbs, increases, or wonderfully impedes. It is a disease for the most part inherent in the first principles of the constitution, and, of course, cannot be removed by any slight or sudden change.

CHAP. XIII.

Of sleep; it's uses, causes, and varieties; it's disorders, defect, excess, and their noxious effects; and of the phenomena and causes of dreams.

388. MAN is not equal to an incessant exercise of sense and voluntary motion: it therefore becomes necessary to intermit the exercise of both functions by intervals, that, by rest and leisure, the powers of the muscles and nerves, exhausted by exercise, may be restored.

389. The state, in which we use our senses, and exert at pleasure the voluntary muscles, is that of watchfulness: the other, in which there is neither sense nor voluntary motion, is called sleep.

390. Either of these may be more or less complete, so that one is neither fully asleep, nor adequate to the proper discharge of the duties of a waking man. Those in full health, who are in deep or sound sleep, have no voluntary motion, or use of external senses: and if there be any exercise of the internal senses, they have no recollection of it. Those whose sleep is imperfect, have some exercise of their sentient powers, and perceive many external objects, but inaccurately; their memory and imagination are busy; they are occupied in many musings, agitated with many emotions; they often talk, sometimes rise, dress themselves, walk, and do many things, as if they were awake. But the vital, and even the natural actions, go on in the deepest sleep, though they are generally observed to be somewhat slower than in the waking state.

391. After the accustomed labours of the day, a light supper, and the moderate enjoyment of the conjugal embrace, sleep steals on very sweetly, aided by the silence and darkness of the night. It is preceded

by a love of rest, and desire of tranquillity both of body and mind, debility, lassitude, a feeling of fatigue, (especially in those muscles which have been chiefly employed,) an inclination to frequent yawning, and stretching the limbs to the utmost. Meantime, the external senses are blunted, the internal confused; the attention is distracted, and will not fix; the imagination rambles, and it's vagaries are mistaken for realities, a sort of delirium ensues, till at last every thing is lost in oblivion. The muscles, fatigued and relaxed, can no longer direct or sustain the parts to which they are attached, nor, of course, the whole body: the eye-lids wink, and at length are shut, the jaw is dropt, the head nods, all the members are slightly relaxed and still, and the body itself is bent forward, unless laid down to sleep. The pulse becomes fuller and less frequent, the respiration slower and deeper, in many attended with snoring; the warmth, and most of the secretions are diminished; and the usual appetites (353.) and propensities, (354.) are not felt.

392. The length of time required for sleep depends greatly on the person's age, constitution, habits, and, in short, on the state of the body at the time. A variety of stimuli put an end to it, either applied externally, or proceeding from within; as light, noise, a rude shake; hunger, thirst, propensity to evacuate the urine, &c. When the sleep is at length broken, it is not done so instantaneously as to prevent some degree of confusion in the internal senses, and dreaming; there is also, for the most part, some dullness or imperfect use of the external senses; and we frequently recollect our morning dream, when the others are forgotten. At last we become quite awake, yawn, and stretch the long bent limbs in the same manner as before sleep; the perception of our appetites and natural propensities is renewed; and, in a short space of time, we recover the use of all our powers of body and mind.

393. The adequate and proximate cause of sleep is still unknown, and perhaps will long continue so. It is improperly attributed to the nerves being alternately

exhausted and replenished with their appropriate fluid; for sleep is easily deferred, in numerous cases, in which the fluid, if such really exist in the nerves and brain, would of necessity be very much exhausted; and it is often long protracted after the nerves ought to be abundantly replenished.

394. It is equally improper to say that sleep is owing to compression of the brain; for, in most instances, no such compression can be shewn, or indeed can exist: and that drowsiness, which is induced by compression of the brain, differs widely from natural sleep. For it does not, like sleep, recruit the strength; nor can it be broken off, so as to prevent the patient from relapsing into it, whenever the stimulus which roused him is withdrawn. But natural sleep is, with the greatest ease, removed by any stimulus, without the least attempt to relieve the brain from compression.

395. All the symptoms attendant on sleep prove, that the state of the whole nervous system, especially of the brain, is much changed; but they do not shew the nature of that change. It is, however, of importance to know the remote causes of sleep and watchfulness, by which that unknown state is induced, and by means of which physicians endeavour, and with success, to regulate sleep as circumstances may require.

396. Every sensation, external and internal, every affection of the mind, every action of the muscles, stimulate the nervous system, and render a person watchful, with an effect proportioned to their force. Thus a vivid light, noise, pain, anger, joy, grief, fear, anxiety, hunger, thirst, vehement desire, motion of the body, lively memory or imagination, intense thought, all tend to prevent sleep. But the total absence, or slighter degree of impression on the organs of sense, the hum of bees, the murmur of the gliding streamlet, the monotony of a dull harangue, in a word, such exercise of memory itself, as is neither too laborious, nor any way interesting to the mind, invite and procure sleep. Such violent impetus of the blood toward the head, as is frequent in fevers, repels sleep: but the free and equal

distribution of it through the whole system, especially the extremities, often induces sleep. Whatever relaxes the body tends to procure sleep : hence various evacuations, the bath, fomentation, sometimes heat itself, are useful to that purpose. After food, and after venery, sleep readily approaches ; the violence of appetite being abated, and the body somewhat relaxed. Intense and protracted cold induces sleep which is not easily broken, frequently terminating in death. In fine, there are substances, which being either applied to the body, or received within it, not only do not stimulate the nervous system, but abate it's energy, rendering it unfit for sense and motion, and in this way induce deep sleep. Such are those remedies called narcotics, opium, and the like : to which we must add wine itself, taken too liberally, and certain deleterious vapours, as that of burning charcoal. Lastly, watchfulness itself is, in some degree, the cause of sleep ; seeing man, all the time he is awake, exercises his organs more or less, and so diminishes and consumes the nervous energy. And, in fact, the necessity of sleep is increased in a degree nearly proportioned to the violence of the exercise.

397. The foetus seems to sleep nearly all the time it remains in the uterus ; and those children which survive a premature birth, sleep almost all the first months. Infants also are accustomed to sleep much. In childhood, we sleep longer and more soundly, than when grown up ; and the labouring classes have the same advantage over the luxurious and indolent ; because the body is properly exercised, and neither surfeited with meat, nor is the mind harassed with cares. Light slumbers, the reward and solace of labour, virtue, and temperance, are seldom granted to the undeserving.

398. Farther, while the body is daily advancing in stature, more sleep is required ; because it contributes not a little to recruit and nourish the body. In middle age, men sleep less. But habit has great influence here. Some are content with four hours sleep, others daily consume in it ten hours or more. Some, worn

out with age, becoming drowsy and torpid, pass the greatest part of their time in sleep.

399. The use of sleep is abundantly evident from the effects which it has on the system. It revives the powers both of mind and body which had been consumed by exercise; restoring to the latter it's former vigour, to the other it's alacrity: the muscles, which had by severe labour become fatigued, stiff, painful, and tremulous, it renders again lively, vigorous, and active: the pulse, which had become frequent toward evening, it tempers, and reduces to the moderation of the morning: it favours digestion, and the assimilation of the nourishment, to repair the loss of the solid parts: it diminishes the secretions and excretions; and by abating the sensibility and irritability of the system, permits the juices to be inspissated. Hence, for the preservation of life and health, sleep is not merely useful, but altogether necessary, and one of the best of remedies for the cure or alleviation of many diseases.

400. Deficiency of sleep is many ways noxious, especially to the nervous system. It renders the organs of both the external and internal senses, and of all the motions, unfit for their functions. Hence proceed depraved, or imperfect sensation, or the total want of it; headach, vertigo, imbecillity, want of memory, a species of delirium, and even insania, debility of the limbs, imperfect and irregular action of the vital organs, frequent pulse, heat, fever, bad digestion, impaired nutrition, emaciation; in a word, the secretions and excretions are increased, obstructed, or disordered.

401. Sleep is obstructed, either in health or sickness, by the various causes already mentioned (396.) Besides, it is deficient in many diseases, few of which are without that portion of pain, of anxiety, or of restlessness, which is sufficient to prevent or interrupt sleep. Fevers of every description generally cause the patient to sleep ill, owing partly to that general uneasiness which always accompanies this class of diseases; partly to the increased impetus of the blood, and that often determined to the head; also to oppression of the stomach,

when loaded with crudities, or distended with drink. This is the reason too why so many hypochondriac and hysteric patients sleep so ill; because their digestion is bad, and their stomach readily affected with many disorders: these indeed often appear to be but slight, though the slightest of them is sufficient to deprive those of sleep, who are already too irritable and easily moved.

402. The same causes which render want of sleep injurious to a person in health, render it noxious to one in disease, but more speedily, and in a still higher degree. This want is the means of diminishing the strength of the patient, increasing the power of the disease, inducing headach or delirium, and impairing the digestion of the food. This defect, therefore, is not only a troublesome symptom of bad health, but often proves the cause of other severe diseases.

403. Excess of sleep is also noxious in no small degree. It renders the person quite feeble, torpid, dull, and almost stupid; retards the circulation, and diminishes the greater part of the secretions and excretions. Hence proceed fulness, obesity, flaccidity, and incapacity for all the functions of life.

404. The causes of such excess are—either the usual causes of sleep already mentioned, (306.) beyond measure intense;—some disease of the brain, as compression, collection of fluid, &c.; or, on some occasions, as it would seem, a great and uncommon debility, induced by some unusual cause, as towards the termination of certain fevers, or in persons convalescent after these or other diseases, although in these cases such lasting sleep is far from being hurtful; or perhaps grief or terror, severe or protracted, may bring on a surprising and unexpected drowsiness. In fine, some persons have, by habit alone, learned to sleep too much, to their great detriment. Nor are instances wanting of persons who, without any evident cause, have passed whole days, or even months in sleep, with little interruption.

405. Such dreams as often agitate the sleeper, producing delight, anxiety, or terror, or by which he is wrapt into new worlds, are by physicians usually account-

ed diseases. In very sound sleep, they are either entirely wanting, or leave no trace or memory of them behind. (390.)

406. They either take place through the person's not being fully asleep, his memory and imagination being yet active, though let loose from the controul of the will; or, they are owing to certain impressions, external or internal, not sufficient to break the sleep, yet so strong as to be felt, of which the person half asleep forms some kind of judgment, and, in a surprising manner, confounds them with the objects of memory and imagination. For these, not being subject to his will, but spontaneously presented to him during sleep, are mistaken for facts.

407. That the above view of the matter is just, is evident from the following considerations: Dreams are familiar to persons, otherwise in the best health, and exposed to no irritation, when sleep is making it's approaches, or when it is retiring. Dreams of a horrible description proceed from corporeal anxiety, (186, 193.) as from lying on the back, or from the stomach being oppressed with much food and wine. Dreams of a singular character originate from the pain of a particular part, from cold applied, a hard or unequal bed, the state of the genital system, or from fevers or various affections of the chest. It would seem that a person in this state, is in search of the cause of his sensations, and often imagines to himself such as are absurd and ridiculous.

408. Again, whatever sensation is thus excited in the person dreaming, is the most vivid possible; because the whole man is in it, the undivided attention is given uncontrouled by judgment. Hence reason has no power in dreams; but fear, grief, desire, in short, whatever happens to present itself to the mind, instantly occupies it, and carries the whole man along with it.

409. Dreams are fleeting, and of the greatest speed; so that a long series of years, and innumerable actions are presented to the mind of the sleeper in a portion of time inconceivably small. It is no way incredible, that the

voice which calls one to awake, may often occasion a long dream before it completely break the sleep.

410. Dreams are greatly regulated by habit ; so that some have acquired the power of either repressing them entirely, or of directing them in some degree. Among so many which are absurd and ridiculous, it would not be surprising though some prove more apposite, or even true ; though some person should be found, of a sound judgment, who, more awake than asleep, in revolving many things in his mind, should foresee certain circumstances which are likely to happen.

CHAP. XIV.

On the circulation of the blood in it's common and natural state.

411. After the peculiar function of the brain itself, the circulation of the blood occupies the next place in importance, if, indeed, it be not in man and similar animals, entitled to the first. At any rate, the organs of circulation have such correspondence with the brain, and the motion of the blood is so necessary for exciting and fitting the brain for the discharge of it's functions, that these two functions give and receive mutual support, and neither of them can be exercised without the other.

412. That the blood circulates through the whole body, is evident from the great, and sometimes fatal loss of it occasioned by a small wound in any part.

413. In an adult the circulation takes place in the following manner: The blood, returning from all parts of the body, passes into the sinus venosus and right auricle of the heart, which it distends, stimulates, and causes to contract; the auricle contracting conveys the blood into the right ventricle: this, again, being in like manner distended and irritated, contracts and impels the blood into the pulmonary artery, by the branches of which it passes through both lobes of the lungs. From that it returns by the pulmonary veins into the left sinus and auricle, by the contraction of which it is propelled into the ventricle of the same side. In short, by the contraction of the last mentioned part, it is ejected from the heart with great force, and impelled into the aorta, by the innumerable branches of which it is conveyed to all parts of the body, and is anew returned by accompanying veins to the cava and right auricle of the heart.

414. That this is the course of the blood is shewn by

valves situated in the heart, in the mouths of the arteries, and in the veins, preventing the reflux of the blood; also by ligatures applied to the veins and arteries, causing them to swell, the latter on the side of the ligature next the heart, the former on the opposite side; in fine, this course of the blood is easily viewed in pellucid animals.

415. The above is, however, far from being the order of these contractions of the several cavities of the heart: the contraction of both auricles takes place at the same time, while the ventricles are both relaxed; and again, both these latter contract at the same time, while the auricles are relaxed.

416. In the last moments of dying persons the left ventricle is the first which ceases to contract, then the auricle of the same side; because, through the failure of respiration, the blood has lost it's stimulating power, or is, perhaps, too sparingly transmitted through the lungs: afterward the right ventricle, and, last of all, the right auricle ceases to contract. Hence it sometimes happens that the blood is forced some little way back through the great cavas, ascending and descending, and produces a slight motion in them.

417. In the foetus, which has never yet breathed, the blood seeks other very different channels. In the first place, great part of the blood of the pulmonary artery, turning aside from the lungs, which, not having been evolved, cannot receive such a store of blood, passes by the canalis arteriosus into the aorta: then great part of the blood of the aorta is conveyed by the umbilical arteries to the placenta; returning thence by the umbilical vein, it passes part of it into the cava by the ductus venosus, the remainder into the liver; and it is not, till it has the second time completed the circuit of this viscus, that it returns at last to the cava and right auricle of the heart.

418. Both arteries and veins resemble a tree, the trunk of which is divided into great branches, these into smaller ones, and again, these last into branches so very minute, that they can by no means be rendered obvious to the senses: but this rule always holds in the division,

that every single branch is of less capacity than the trunk whence it rises, though the capacity of all the branches taken together, is somewhat greater than that of the trunk.

419. The smallest branches of the arteries, (the greater never) being reflected, become veins, or unite with such veins already formed by what is called anastomosis: and the smallest veins, by the successive accession of others, are enlarged, and at length form the cava.

420. In the abdomen, however, another structure is observable, and a far different return of the blood by the veins. For the blood, on it's return from all the viscera which are subservient to digestion, the stomach, intestines, mesentery, omentum, pancreas, and spleen, is conveyed into a large vessel, the vena portarum; which again, being distributed like an artery over the liver, conveys to it a great quantity of blood, and this after serving for the secretion of the bile, returns by the hepatic cava into the great cava, and to the heart.

421. In the head, also, the return of the blood is observed to be somewhat singular. In that part particularly, there are great and very numerous instances of the union or anastomosis of vessels, and even of the large ones; and the lesser veins almost immediately pour their blood into large vessels, which are called sinuses, and are generally inserted into them in a retrograde direction.

422. In fine, in certain organs which require to be occasionally erected, such as the male penis, the nipple of the female breast, and, it would seem, some part of the genital organs of the female sex, the structure, and sometimes the course of the blood is different. In these instances, the blood, being effused into certain cells of the retiform membrane, which are fabricated by nature in a peculiar manner for this purpose, and by means of unusual action of the arteries, conveyed in greater quantity than can return by the veins, (which, in the opinion of some writers, are in some measure constricted and compressed), distends those parts, erects them, and

adapts them to their functions; and at last, in due time, by the gradual contraction of those cells, being again taken up into the veins, returns to the heart.

423. The powers which facilitate the circulation, are, first, the contraction of the heart, which impels the blood with great velocity into the arteries: but this force, though it is distinctly felt at the extremities of the system, is far from being adequate to maintain the circulation; as is evident from the deficiency of the pulse and of warmth, in an arm affected with palsy.

424. The action of the arteries also contributes to the circulation, not only by their great elasticity, but by their peculiar contractile power. The wave of blood expelled from the heart, propels the blood already in the arteries, and, at the same time, as the pressure of a fluid is in every direction, it distends the artery itself. This distention is the pulse, which we perceive with the finger. But the arteries thus distended, are stimulated to contraction in the same manner as the heart itself; and their contraction is made with such velocity, that the interval is extremely small indeed, which can be distinguished between the stroke of the heart or of the carotid artery, which is next it, and the pulse in the remotest part of the body.

425. This action of the arteries, is sufficiently proved by the structure of the artery itself, which is evidently furnished with a muscular tunic;—also by many experiments instituted on living animals, where the arteries contract very powerfully on the application of a mechanical stimulus, for a chemical stimulus is little to be depended on; above all things, it is proved by inflammation, whether spontaneous or excited by art, as when cantharides, mustard, or the like, are applied to the skin. Nor can any other reason be given, why any secretion is unusually increased, while the circulation through the rest of the body is little or nothing changed.

426. The contraction of the artery always propels the blood from the heart to the more remote branches; chiefly because the semilunar valves, placed at the en-

trance of both the great arteries, completely intercept it's return to the heart; it must therefore take the course which is left open. Again, though the contraction of the artery is with the greatest velocity propagated to the minutest branches, yet, by commencing near the heart, it in some degree directs the course of the blood, and nearly performs the function of a valve, by precluding it's return, and permitting it's free advance.

427. Impelled by these powers, the blood passes into the veins to be conducted back to the heart. The structure or muscular power of the veins is not yet sufficiently ascertained, unless in the great trunks near the heart. The blood, therefore, seems to be moved in them, partly by the impulse which it received from the heart and arteries, partly by the contraction of the contiguous or incumbent muscles which compress the veins. These also are furnished with valves, especially in the muscular parts, which prevent the return of the blood to the arteries, and permit it's progress to the heart.

428. The great influence of the contraction of the muscles, in facilitating and stimulating the circulation, is evident, from the fact that the circulation is surprisingly increased by exercise; and, from it's languid state, attended often with considerable inconvenience or danger, brought on by indolence; though persons very much addicted to indolence, or even in sleep, have always some exercise of muscular motion.

429. This enables us to account for many diseases, and for the remedies which we employ in order to their cure. Hence, also, is understood, wherefore bodily rest is so necessary in the greater part of acute diseases, and why, in so many others, frequent exercise is the best remedy.

430. Lastly, the blood can neither circulate through the lungs, nor through the rest of the body, not even through the left side of the heart itself, without respiration. This will be accounted for in the proper place.

431. The velocity of the blood is greatest near the heart, it becomes much slower in the smaller and re-

mote branches of the arteries. To this effect every kind of friction contributes; the tenacity of the blood itself, it's adhesion to the sides of the vessels, the weight of the parts separated and not perfectly elastic; but the retardation of it's motion is most of all owing to the increased capacity of the artery according to it's division into branches (418.) And, in fact, all the other causes of retardation may be reduced to this as the measure of the whole, provided there were no obstruction any where; for whatever portion of it's velocity the blood may have lost by other causes of retardation, could have been restored and compensated by the contractions of the arteries.

432. As for this reason, in the arteries the blood flows more slowly the greater it's distance from the heart, so in like manner, in the veins, the nearer it approaches to the heart, it moves with the greater velocity (418.) But it's motion in the veins is much slower than in the arteries, for this reason, that taking them all together, the capacity of the veins is double or triple that of the arteries.

433. In fine, the weight of the blood itself, either quickens or retards it's impetus, according to the position of the body, or of any part of it; which is a matter of no slight importance, either as to inducing or curing disease.

434. Arteries terminate in various ways. They are either reflected and become veins, which admit all the parts of the blood, both the grosser and finer; or they are farther divided into branches too small for admitting the grosser particles, and of course convey only a pellucid liquor, and have their accompanying veins, or they terminate in exhalant, secreting, or excretory vessels.

435. The exhalants pour the thin portion of the blood into all the cavities of the body, by which these are furnished with moisture; whether they be of the larger description, as the abdomen, thorax, or head; or of smaller capacity, as the cells of the cellular membrane.

436. The excretory vessels, incessantly exhale from the skin and lungs, the very thinnest part of the blood, chiefly water with a small portion of animal oil, and a considerable quantity of other substances, the nature of which is not yet sufficiently investigated.

437. The secreting vessels, in short, being a continuation of the arteries, in certain organs of the body, not only exhale certain parts of the blood drawn off from the remaining mass, but also change them in a surprising manner, and generally convert them into another nature. Of these, however, we will have an opportunity of speaking, when we come to treat of secretion and excretion.

438. The finer part of the blood which is poured into the cavities of the body, is constantly taken up again from them, and conveyed back to the heart, by means of absorbent vessels, or, as they are termed, lymphatics, which, taking their rise in every part of the body, internal or external, as the skin for instance, often run along near the large blood-vessels, and at last terminate in the receptacle of the chyle, thoracic duct, or in the subclavian vein itself. To this class of vessels belong the lacteals, which rising from the intestines, and traversing the mesentery, convey the nourishment into the blood.

439. All the absorbent vessels, whether under the name of lacteals or lymphatics, whether originating with open mouths, or pendulous in the cavities where they commence, seem to imbibe their humours by some power similar to that of capillary tubes: for there is no impulse by which they can be filled, nor can any such impulse be employed by art to fill them from their proper cavities, such as the thorax or intestines. Yet the muscular power of the absorbent vessels, together with such pressure as they are exposed to, assist the motion of the lymph or the chyle which they contain. For the lymph is precluded from returning by the innumerable valves with which the vessels abound.

440. This description of vessels has also innumerable conglobate glands, which they enter, and which in fact

they seem in a great measure to form; the glands, however, are in all cases furnished with some small nerves and blood-vessels; whence they have sensibility and irritability, and, of course, are sometimes subject to inflammation. They are very numerous in certain parts of the body, as in the groin, the armpit, and mesentery.

441. Their use is little known: they are said to fabricate, and, as it were, polish certain whitish particles, such as are found in the red vesicles of the blood; but this is rather uncertain.

442. These conglobate glands are often obstructed, and swell to a great size, owing for the most part to some acrid substance conveyed to them: sometimes perhaps to causes less known, as in the disease called scrofula, or struma, of which they seem to be the primary, or at least the most frequent seat. But nothing certain is known of the nature or origin of this disease, or even of the presence of acrimony in the beginning of it, when the glands first swell: though there can be no doubt, that, after they have been long obstructed, inflamed, and exulcerated, a great deal of acrimony is generated, and perhaps diffused through the whole system.

CHAP. XV.

Of the varieties and disorders of the circulation.

443. THE proportion which the heart, and all the vessels which contribute to the circulation, as arteries, veins, and absorbents, bear to the rest of the body, is observed to be greater in early than in advanced life: it is greatest in the foetus, but is proportionally diminished every day; many of the vessels being by degrees shut up. Hence the new born child is ruddy all over; in infancy, childhood, and often in youth, he is soft, smooth, humid, flaccid, and of an excellent complexion; but in the vigour of life he becomes firmer, harder, of darker complexion, and of impaired beauty; when an old man, he is rigid, dry, pale, and emaciated.

444. In early life, the veins are much more dense, firm, and strong than the arteries. But these latter, owing to the incessant pressure which they endure, and the power which they exert in contraction, daily acquire more firmness, hardness, and strength, until their power equal or exceed that of the veins. In old men, part of the great artery is frequently found converted into a horny substance, or even into real bone.

445. In early life, therefore, there is a greater proportion of blood in the arteries, but in advanced life the greater proportion is in the veins; this circumstance is of considerable moment, as it furnishes in some degree a reason for the increment, the acme, and decay of the system. Farther, if there be a superabundance of blood, whatever inconvenience arise from it, must manifest itself more readily, in early years, in the arteries, and in the decline of life, in the veins. This, at least in some degree, accounts for some diseases, which commonly attend certain periods of life.

446. The females of many, perhaps of all species of animals, have their arteries considerably more capacious and lax, compared with their veins, and the veins themselves of much less capacity than those of the males of the same species: this is particularly observable in the descending aorta, compared with the corresponding ascending cava; the intention of this is evident, namely, to render them more adequate to the nourishment of the foetus during the period of gestation. In the same manner we may account for women being more disposed to a full habit of body than men. We must also ascribe to this enlarged capacity of the arteries, and smallness of the veins, the beauty of the female countenance, the exquisite colour of the skin, and the elegance of their arms, in which are no livid veins, as in men.

447. Farther, the supply of blood varies in different parts, and in the same parts it is in different proportions at the various periods of life. When the foundations of the animal structure are first laid, a great supply of blood is sent to the head, which must be first formed and evolved, and fitted for it's functions; and in fact the head attains it's due magnitude before any of the other parts. But the resistance increasing, and the parts not readily admitting of farther dilatation, the blood is diverted to a different quarter. Then the remaining parts of the body grow proportionally more than they did formerly; and certain organs, hitherto very imperfect, and as it were useless, are now evolved and perfected, and fit for their peculiar functions.

448. The effects of the change of the circulation in an infant, are observable in a short time after birth. As no blood passes by the navel now, and of course more is sent by the iliac arteries to the lower extremities; these, which in the foetus were small and slender, have such a rapid growth, that often within the year, sometimes in less than six months, children are able, not only to stand firm on their own feet, but even to walk.

449. Practitioners usually judge from the pulse of the state of the circulation; but that is very various,

both in respect of frequency, and in the force of the strokes and equality of the intervals.

450. The ordinary frequency of the pulse, in an adult in good health, is about seventy in a minute; in the foetus, perhaps even the double of that number or more. In a child a few months old, it is scarcely below one hundred and twenty; in a boy or a young man, it becomes slower, by little and little; in decrepit age it sometimes falls to fifty or under.

451. Besides, in many, especially of greater irritability, the pulse is more frequent, while in others, even in the prime of life, it is very slow; in women too, it is generally somewhat more frequent than in men.

452. It becomes more frequent, both in the healthy and diseased body, in proportion to the numerous stimuli applied to it. Exercise, particularly by promoting the return of the venous blood (427, 8.), quickens the pulse amazingly; also various irritating causes which affect the nervous system, such as the affections of the mind, intense thought, pain, heat, stimulating medicines, wine, spices, and the like, produce the same effect. Many medical men think that the acrimony of the blood itself also contributes to increase the frequency of the pulse.

453. The pulse is slow in the morning when we are first awakened, and gradually becomes more frequent from the many irritations to which we are exposed; being more intense after food, particularly animal food, or that which is acrid, or highly seasoned; towards evening there comes on slight feverishness, which is carried off by rest and sleep. These circumstances are with difficulty to be observed in a person of sound health, but shew themselves evidently in the feverish patient, particularly in a hectic one.

454. In a word, mere debility seems often to increase the frequency of the pulse, or at least to contribute somewhat to that effect; because in that case, the ventricle of the heart not being completely emptied, it's distention is quickly renewed, and it is anew stimulated to contract. The practitioner, therefore, can never

form a judgment of the impetus of the blood from the frequency of the pulse.

455. Lastly, in all fevers, however differing among themselves, the pulse is observed to be too frequent, owing perhaps to a variety of causes; to debility, to the acrimony of the humours, to the blood repelled from the surface of the body, accumulated in the large vessels and stimulating them; owing also to the various morbid irritations which are never wanting in a body already disordered and too irritable; or owing, in a word, to certain efforts of nature (364, 68.), for relieving the system from such a disease; in this matter, however, much is obscure or altogether unknown; nor can any readily say how this autocrateia of the body operates; or whether such frequency of the pulse is, or is not, to be referred to it's efforts.

456. The pulse is seldom observed to be too slow, unless from diminished mobility of the system, as in extreme old age, or when the brain is compressed, or otherwise disordered. But more severe compression of the brain commonly produces great frequency of pulse, as in hydrocephalus, apoplexy, &c. Sometimes it is surprisingly slow in hydrops pericardii, and other diseases either of this sac, or of the heart itself. In convalescents, after long protracted fevers, the pulse is sometimes observed unusually slow: the matter is of no great importance; and some degree of torpor appears to be it's cause. Certain sedative medicines, especially some narcotics, as digitalis, seem on many occasions to render the pulse much slower than usual.

457. But while the frequency of the pulse remains unchanged, it may vary otherwise, being full, large, vigorous, strong, or hard; or, on the other hand, small, feeble, and soft. The pulse is full, large, or strong, when the ventricle empties itself forcibly and completely, and throws a great wave of blood into the arteries, which distends them completely, and stimulates them to a vigorous contraction. Such is the pulse of a strong healthy man, and it is rarely supposed to imply disease. But if it become too strong, and strike forcibly and

sharply the pulp of the finger of the person who examines it, it is said to be hard. This hardness is owing to the sudden and violent contraction of the ventricle of the heart and arteries, which distends too suddenly and sharply the remoter branches, of the carpus for instance, and stimulates them to contractions equally sudden and violent. A hard pulse, therefore, is an evidence of excessive action of the heart and arteries.

458. It proceeds, however, from a variety of causes: in the first place, from too great tension of the arteries, owing to excessive fulness, by which they become more prone to action, and more susceptible of violent motion (321, 22, 23.); it proceeds also from too great density or firmness of the solid parts, hence it is more common in cold regions, and cold seasons, and familiar to robust and vigorous persons, and to those accustomed to hard labour (88, 91.); in a word, it may proceed from various excitements, affecting either the whole nervous system, or only the heart and arteries. Lastly, it accompanies many fevers, and the greater part of inflammatory disorders, whether these be owing to a general stimulus applied to the whole system, or to the irritation of certain parts, which may have extended gradually to the whole; such a state of the circulation as this pulse shews, often requires venesection, and, in general, bears the loss of blood well.

459. A small, feeble, soft pulse generally proceeds from causes opposite to the former, and evinces an opposite condition of the circulation, and of the nervous system; it often requires stimulants, but for the most part neither requires blood-letting, nor can easily bear it; sometimes, however, such a pulse is observed, though severe inflammation be present, as when the stomach or intestines are inflamed; in these and the like cases, we must attend rather to the nature of the disease, than to the state of the pulse.

460. The pulse is said to be intermittent, when the stroke is not repeated after the usual interval, and a space is interposed, often double, or triple, or in some cases even four times the usual interval.

461. This sort of pulse is almost natural and constant in some animals; it is familiar to some persons who enjoy excellent health; and when those persons are affected with fever, the pulse in some instances becomes regular, and the disease is no sooner overcome than the intermittent pulse returns.

462. Some persons, whose pulse is regular while they are in health, have an intermittent pulse if they are attacked by even the slightest disease. Some others, especially hysteric or hypochondriac patients, or those affected with diseases of the stomach, will have an intermittent pulse, from a slight uneasiness at stomach, from some affection of the mind, or sometimes from a cause more trifling and unobserved. They are commonly aware of this state of the pulse, without examining the pulsation of the arteries, merely from the profound anxiety which they feel in the chest whenever the pulse intermits.

463. In fine, in certain diseases of the breast, particularly water in the chest, severe inflammation of the lungs, and very difficult breathing; in various disorders of the heart itself, it's valves, or larger vessels; and in almost all diseases, especially fevers, toward the end, when the patient's strength is exhausted, and death is breaking down life's last resort; in such cases an intermission of the pulse is observed: a very bad prognostic, and often the forerunner of death.

464. This intermission seems to proceed either from the unequal influx of the nervous power into the heart and other organs of circulation, which, however, is but of little moment; or from the same power being now broken and exhausted, and the heart not fully adequate to contraction, not emptying itself completely till it be more than usually distended; or, in fine, from disorders of the heart and contiguous parts which arise from tumours, water, or the like, compressing it and impeding it's action: a very dangerous case, which can scarcely fail of being fatal.

465. Some physicians have described not a few other varieties of the pulse, and have supposed that the issue of

various diseases might be predicted from them; this opinion we leave to the authors of it. For these things are not yet so established by repeated observations, at least, in our country, that it would be safe to trust to them; neither, in fact, is any explanation as yet given of them, nor is the state of the circulation which produces them at all known.

466. The motion of the blood may be too violent, too feeble, or, in short, irregular.

467. The reason of too violent circulation may be readily assigned from the preceding remarks. (452, 58.) A frequent pulse (other things being supposed equal,) renders it's motion more rapid; for the more quickly the ventricle of the heart empties itself, the blood is thrown with the greater velocity into the arteries, and their action must correspond to this more powerful stimulus. Also, a large and vigorous pulse, (caeteris paribus,) must accelerate the motion of the blood. Therefore, various causes of each state of pulse, acting either jointly or separately, bring on this disorder of the circulation: such are exercise, heat, stimulants, plethora, irritation of every kind, pain, elevating passions, or fevers.

468. But too violent impetus of the blood distends the vessels, stimulates the whole body, heats, and often debilitates it, increases sweat, but commonly diminishes the other secretions; impedes and disturbs the various functions both of mind and body; induces thirst, obstructs nutrition, consumes the fat, and, if the received opinion be correct, favours putrescency. Sometimes the violent impetus of the blood bursts the vessels in their weaker parts, producing effusions, haemorrhage, &c. But it must by no means be passed unnoticed, that the excessive velocity of the circulation, however faulty it may seem, is among the most excellent auxiliaries which nature uses for the cure of numerous diseases.

469. The circulation often becomes languid, chiefly from debility, torpor, or want of excitement, of exercise, for instance: whenever the powers fail, and either are not, or cannot be excited, to due activity. Farther, the

motion of the fluids becomes languid, when there is obstruction, or any such cause as may impede their passage, or render it more difficult.

470. In this way, on account of the weight of the blood itself, the fluids will return more slowly from the inferior extremities, when one remains long in a standing posture. Again, any disorder of the heart and arteries, as enlargement, constriction, or ossification, cannot fail to obstruct the circulation. Any obstruction too, affecting the veins, renders the circulation slower; should the liver, for instance, be indurated, (a case which often occurs,) so that it is scarcely pervious to the blood flowing through the vena portarum; or, in fine, should the respiration be so obstructed that the blood could not pass freely through the lungs to the left side of the heart: but, in this state, other noxious circumstances seem also to concur.

471. But whatever be the cause of a more languid circulation, the bad consequences of it fall chiefly on the veins, because the circulation is always slower in these (432.). Hence proceed dilated veins, and congestions of blood, especially in those parts, the veins of which are destitute of valves, and in which the motion of the muscles cannot assist the circulation.

472. For a similar reason, dropsy often proceeds from obstructed or languid circulation; because, by increased resistance in the veins, the blood is with greater difficulty received into them from the arteries, and a greater quantity of thin humour is impelled into the exhalants, (435.) which cannot be so readily taken up again by the absorbents.

473. These, however, and not a few other disorders, which are owing to a languid motion of the fluids, are of more slow and difficult cure, because all the powers of nature fail at the same time. But those which proceed from excessive impetus of the fluids, soon terminate either by speedy death, or happy recovery.

474. There is also a very common disorder of the circulation, when the blood, which ought to be conveyed to the several parts in a certain quantity, is conveyed

to some parts in too great abundance, and with more than due force: whence a deficiency takes place in other parts, which are defrauded of their due supply.

475. Such irregular distribution of the vital fluid often proceeds from a stimulus applied either to the particular part, or to others perhaps very remote, or which affecting the brain, or even the mind first, by the laws of sympathy, (355, 363.) produces a certain and definite distribution of the blood.

476. It likewise proceeds frequently from spasm, induced on other parts considerably remote, that directs into new channels the blood which is driven out of it's ordinary course.

477. According as this irregularity of distribution is greater or less, the more numerous and severe, or the fewer and slighter will be the disorders proceeding from it: these are the following; heat, swelling, redness, inflammation, lacerations of the vessels, haemorrhage, effusions, solution of the cellular texture, and of the contiguous parts, their destruction, corruption, or suppuration.

478. This, too, which at first sight seems a disorder, nature often uses with success, and converts into the best of remedies. Nor have practitioners disdained to tread in her steps, and to change and direct, to the utmost of their power, the distribution of the blood in various diseases: nor have they had cause to repent so doing. For they have fully experienced that the change of the distribution of the blood is often a most excellent means, both of curing diseases, and of alleviating their most urgent symptoms.

479. Lastly, there remain yet to be considered certain faults of the motion of the heart itself, neither indeed so slight, or so simple, as to be undeserving of the practitioner's attention: these are palpitation, and syncope or fainting.

480. Palpitation is a violent irregular action of the heart, which, for the most part, is felt both by the patient himself, not without great anxiety in the chest, and by the bystanders, on applying their hand to his

breast; in some instances, it may even be seen, the ribs being struck with such violence that the whole chest heaves. While the heart palpitates, the pulse of the arteries is observed to be for the most part feeble, unequal, and intermittent.

481. This disorder, in it's nature spasmodic, is induced by various causes, whether affecting the whole nervous system, or the heart only. All the diseases of the heart itself, it's valves, and vessels, as constriction, enlargement, ossification, or polypus, by impeding the free action and depletion of the heart, stimulate it to unusual and violent contraction. A superabundance of blood, or it's too great force, occasioned by running, &c. may produce the same effect.

482. Besides, the heart being an organ of great irritability, often palpitates in consequence of the nervous system being violently affected, or having it's mobility preternaturally increased. Hence palpitation sometimes proceeds from an affection of the mind, and is, therefore, a disease familiar to hysteric patients.

483. It often proceeds also from the stomach when it is stimulated, distended, or oppressed with worms, a great load of crude or corrupted food, various acrid substances, or flatulence abundantly extricated during imperfect digestion.

484. Palpitation accompanies the gout when it is repelled, or irregular. Sometimes it is owing to debility, and often to difficulty of respiration, whatever be the cause of the latter. Various causes of palpitation may also be combined, and one produce another.

485. Hence, it is evident, how it often proves an incurable disease, and, sooner or later, fatal; and how it is often slight and fleeting; often recurring at intervals, induced and increased by exercise and every irritating cause; and sometimes alleviated or removed by stimulating remedies and exercise.

486. Syncope or fainting (to which medical men have given various names, according to it's degree of slightness or severity), is a sudden and great failure of the action of the heart, and of the arteries at the same

time; so that the animal powers of sense and voluntary motion immediately cease.

487. In general, the causes of palpitation may sometimes induce syncope also; for, whatever is capable of disturbing and convulsing the action of the heart, may, on some occasions, debilitate and suspend it.

488. Therefore, a faulty structure of the heart itself, strong passions, whether depressing, or producing sudden and violent excitement, various disorders of the nervous system, some diseases of the stomach, debility of every kind, all evacuations, especially loss of blood, excessive, or unintermitted toil, long continued watching, heat, pain, many poisons, &c. may occasion fainting.

489. Whatever enfeebles the circulation through the arteries of the brain, may induce syncope; whatever facilitates it, may recover one who is fainting.

490. Hence it is easy to see how the mere position of the body may induce, or prevent syncope, or recover from that already come on.

491. It is also evident that this disorder is not without it's peculiar dangers, and may be of the worst prognosis, since it is often continued till it prove death; sometimes it is very slight, and goes off spontaneously, without requiring medical aid. In fine, the skilful practitioner, the imitator and rival of nature itself, not unwisely desires the aid of syncope, and brings it on of design, that he may preserve his patient safe from insupportable pain, haemorrhage that cannot otherwise be stopt, or ungovernable impetus of the blood.

CHAP. XVI.

Of the nature of the blood; it's varieties, and disorders.

492. The blood itself, the motion and distribution of which is so necessary to life, is far from being a simple fluid, or uniformly the same: it contains different substances, apparently of various utility, and is liable to it's peculiar varieties and disorders.

493. When drawn from a vein, and received into a proper vessel, it manifests, in some degree, it's nature and composition, provided the changes which it spontaneously undergoes be observed with attention.

494. It first exhales, but in very small quantity, a subtile vapour, and of a very faint odour, in general of an aqueous nature; if allowed to remain at rest, and cold air be admitted, it soon congeals into a very soft, tremulous mass, of a deep red colour: a little after, and more speedily if the mass be cut, there arise on it's surface some very small drops of a thin, yellowish, pellucid fluid, which increasing in number, at last run together, surround the grosser part, and separate it from the sides of the vessel.

495. The grosser part, or crassamentum, which alone is red, on a more accurate examination, shews it's ulterior composition. It contains much of the thinner part, which is called serum; being well washed, it loses it's redness, what remains being glutinous, tenacious, and whitish; this part, now by chemists denominated fibrine, had formerly these various names, fibre of the blood, coagulable lymph, or gluten.

496. The crassamentum contains also innumerable red particles commonly called globules, which commu-

nicate their colour to the whole blood. These, when examined by the assistance of the microscope, exhibit each a most beautiful structure, which however differs considerably in different animals.

497. In man, and the most part of the other animals, they are round and flat, like coins. The exterior part, which alone is red, is a bag or vesicle, containing a central part much smaller than itself, and apparently a solid globule.

498. The thin part of the blood which is called serum, on applying a proper degree of heat, coagulates likewise into a whitish, tenacious mass, called albumen, pretty similar to the fibrine or coagulable lymph, which congeals of it's own accord; from this mass again, may be expressed a thin fluid called serosity, which contains some portion of gelatine.

499. Blood also contains various salts dissolved in it's serum; particularly phosphate of soda, phosphate of lime, muriate of soda, pure soda, and a little hydrosulphuret of ammonia.

500. The whole blood, as it flows from the vein, coagulates at a temperature much lower than that which suffices to coagulate the serum, but higher than it ever reaches in the living man.

501. The red particles, while they swim in the serum, or any similar fluid which holds some salt in solution, for some time preserve their proper figure unaltered. But when diluted with pure water, they soon swell, the vesicle is distended in the shape of a globe, is at last ruptured, and dissolved, and the central particle escapes from it. This, therefore, seems to be one use, and possibly not the least, of the serum, and the salts which it contains, to dilute the whole mass of blood, render it capable of motion, and preserve the red particles entire, and of their due figure.

502. The origin, end, and use of the red particles, are equally uncertain and obscure; some are of opinion, that the central particles are formed in the conglobate glands of the absorbent system, and in the first period of life in the thymus; that they are reabsorbed into the

blood, conveyed to the various organs of the body, and being clothed with their exterior red covering in the spleen, are, by it's absorbent vessels, conveyed back to the heart. But these, and the like theories, seem to want confirmation.

503. It cannot be doubted, that particles fabricated with such care, serve a very important purpose in the system, though this be little known hitherto. There have not been wanting some mathematical physicians, who have supposed that they contribute in some degree to the generation of animal heat; but no sufficient reason is assigned for that opinion. They doubtless fill and distend the larger vessels, the smaller ones they do not enter, nor can they easily escape from the body. They seem to promote nutrition in some degree, being found in the greatest numbers in a strong well fed animal, but very few in one famished and exhausted.

504. Fibrine, albumen, and gelatine, likewise serve for completely distending and filling the vessels, and prevent the efflux of the vital fluid; for a humour, the component parts of which are all thin like water, could not have sufficed for the purposes of life, as the vessels, expanding into innumerable openings, could not have retained it. These principles appear eminently subservient to nutrition, because they not only contain much nutritive matter, but all the aliments, by a double process of concoction in the body, first in the stomach and intestines, and afterwards in the lungs, are converted into these, before they are distributed to nourish the system and repair the waste of the solid parts.

505. The uses of the whole mass are various, and of the greatest importance. In the first place, being properly distributed, it stimulates the nervous system; it appears to contribute not a little to the generation of animal heat, and it's diffusion through the whole body; besides, the blood is the store whence the several fluids, adapted to their several purposes, are derived or secreted.

506. The parts already described, are seldom wanting in the blood; and it is seldom that any others are

discovered in it. In some cases, however, there has been either no fibrine, or the quantity so small, and that so corrupted, that blood drawn from the veins did not congeal, and the red particles like sand fell to the bottom of the vessel. A very bad prognostic.

507. Sometimes the serum is observed white as milk, which seems to be owing to fat reabsorbed, but not again converted into gluten. It is likewise often found preternaturally yellow, from bile returning into the blood.

508. The blood often congeals in a manner somewhat uncommon, and the crassamentum is covered with a white tenacious crust like leather. This crust is nothing but pure fibrine, congealed more slowly than usual, whence it happens that the red colouring particles in some degree subside.

509. The above circumstance does not prove, as was long believed, any lentor, density, spissitude, or tenacity of the blood, but rather shews it's thinness, at least a diminished tendency to coagulation. It proceeds for the most part from more violent agitation or concussion of the blood within the body; hence it accompanies many fevers, inflammations of almost every description, eruptive fevers, sometimes haemorrhage, or a full habit of body, pain, and many irritations. Nor is such a crust to be always viewed as a symptom of disease, it is found in the best state of health; as in females in the first months of pregnancy; in strong men of laborious habits, who live well; and indeed in persons of almost every class, more frequently in the winter and spring, when the solid parts are most vigorous, and the action of the blood-vessels is greatest (467.). Besides, it may be either brought on or impeded by the slightest causes, while the blood is flowing, or afterward by the shape of the cup into which it is received; so that no crust at all is observed in one cup, while in another it is very dense and tenacious.

510. Hence it is easy to explain why blood-letting is proper when such a crust is observed, and how the body comes to bear it well. It is likewise evident what

great danger might attend the mistake of those who advise repeated bleedings, till the blood should flow without the crust, believing that to be the diseased part of the blood. It is in fact a most useful sign to the practitioner, though by no means the only one by which he is to be directed.

511. Sometimes during life, but more frequently after death, especially when the organ is diseased by enlargement, obstruction, &c. that same fibrine of the blood congeals in the large vessels near the heart, or in it's cavities, into a tenacious mass called a polypus. Similar masses called molae, are also frequently formed in the uterus.

512. The quantity of the whole mass of blood, or of it's several constituent parts, is not readily reduced to measure. It may vary greatly without injury to health; but when there is excess or deficiency of it in the system, it proves at last pernicious in no slight degree, and frequently the cause of many severe diseases.

513. Blood is collected in too great quantity, by the use of much fat and nutritive food, especially of the flesh of animals, and of strong liquors, provided the digestion be good; by an indolent and sedentary mode of life; by much sleep, particularly in the case of persons formerly accustomed to much exercise; by the suppression of customary evacuations; by habitually acquired evacuations of whatever kind, provided they be such as diminish the vital power, and render the excretions languid; above all, by the suppression or gradual deficiency of sweat or insensible perspiration. Persons of a lax and feeble constitution are more liable than others to this disorder.

514. Many diseases proceed from excessive fulness. A person becomes greatly oppressed, dull, languid, and feeble, and the organs of circulation become inadequate to give due impulse to such a load. The pulse languishes, and in some cases syncope, vertigo, and palpitation are observed. But more frequently the vessels being over distended, become predisposed to unusually violent and irregular motions.

515. Thus a tendency is acquired to fevers, to inflammations, unequal distribution of the blood, unusual congestions of it, lacerations of the vessels, and haemorrhage. Farther, excessive irritability, and tendency to spasms, and other diseases of the same kind proceeding from plethora, on account of the close connexion between the sanguiferous and nervous systems.

516. Hence it is understood why plethora is attended sometimes with a feeble pulse, at other times with a vigorous or hard one; why it is a cause and a part of so many diseases; why it is frequently the effect of long continued health; and by what means it may be most effectually reduced,—whether by restoring the former suppressed evacuations, by instituting new ones, or by slender and sparing diet, and vigorous and frequent exercise.

517. Medical men, have also been of opinion, that they have discerned several other species of fulness, distinct from this real and absolute plethora; of these they have treated largely, though frequently with too much refinement.

518. Plethora ad vasa, is that fulness which is owing solely to the constriction and straitening of the vessels, without any addition to the quantity and volume of blood, so that they cannot, without difficulty and inconvenience, contain their usual quantity and volume: as when the minute extremities of the vessels are greatly constricted by the attack of fever, sudden terror, or excessive cold; when in old age some of the vessels grow together and become impervious; or, in fine, when the body is mutilated by the amputation of a limb.

519. Another spurious fulness, called plethora ad molem, is said to happen when the blood, not at all increased in quantity, is expanded, increased in bulk, and distends the containing vessels in the same manner as in a true plethora. Great heat, either external, or arising from fever, exercise, or stimulants, is supposed to induce this kind of disorder, the relaxation of the vessels not keeping pace with the rarefaction of the

blood. Farther, any uncommon rarefaction of the air, especially if suddenly produced; such as takes place in a great change of temperature, or is felt by those who ascend high mountains, is said to rarify the blood, by expanding the air which it contains. Have not mathematical physicians deceived themselves a little on this subject, imagining that the volume of blood was increased, when the fault rather lay in it's impetus being increased (452, 458, 467.) by heat, violent exercise, and other stimulants?

520. Plethora ad vires, is such a superabundance of blood as oppresses the moving powers (514.) Such plethora, in a great degree, always produces inconvenience, and therefore is said to be ad vires. When the patient's strength has been much reduced by some other cause, this kind of disorder is frequently observed, arising even from a trifling excess of blood, which a vigorous person would have borne without injury.

521. It will be readily observed, that the various species of plethora may affect the same person at once, and that the bad consequences are aggravated by such conjunction.

522. A deficiency of blood is also very noxious; it debilitates a person, renders him inadequate to all the functions of life, makes the circulation languid, induces syncope, convulsions, and at last death; if the deficiency be more slight and of longer continuance, the body becomes emaciated through defect of nutrition, and it's functions are in various ways deranged.

523. Such deficiency of blood is owing to long abstinence, bad food, or such as contains little nourishment, the imperfect digestion of sufficient food, or to obstruction of the channels by which the prepared nourishment is conveyed into the blood; or it is owing to fevers, or other diseases which exhaust the body and impede it's nourishment; or in short, to various evacuations, especially if they consist of blood, and are suddenly effected; for the vessels accommodate themselves surprisingly to slow evacuations; besides, if the body be slowly emptied, the excretions are diminished on

account of the defect of vital power, so that by an unusual retention, the extraordinary waste is in part at least easily compensated. But if the evacuation be effected suddenly and to a great extent, it may either prove speedily fatal, or so break the constitution that the patient may never completely recover.

524. A great or lasting deficiency of blood can scarcely fail to vitiate the qualities of that fluid. Because the thinner part indeed, may be easily and quickly repaired, but the grosser part, as the fibrine and red particles, not so quickly. Hence the blood becomes thin, pale, with little redness, it's parts not readily congealing, nor affording the body due nourishment.

525. Farther, the blood is rendered too thin by much drink, especially of a watery description, by thin food, or that which possesses little nourishment, by bad digestion in the stomach, or perhaps in the lungs; also, by the diseased state of those organs which prepare the grosser parts; by the suppression of the thinner excretions, such as sweat or urine, either from cold or disorder of the organs; or in a word, and, as almost all medical men have supposed, by a putrid tendency of the whole system, especially of the fluids. This subject is indeed matter of controversy, but if the opinion formerly prevalent be correct, it is evident that beside the mere attenuation, there is for the most part a concurrence of other disorders of the blood.

526. Too thin and aqueous blood renders the countenance pale, the body feeble, languid, and torpid; the solid parts lax and flaccid, owing to defect of nourishment, and to excess of humidity in the system (82, 88.); it induces watery or dropsical effusions in every part of the body, because the exhalation of the thin fluid, which bedews all the hollow organs of the body, is increased, owing partly to the dissolved state of the blood, which makes it's escape too easily and copiously, and partly to unusual relaxation of the vessels, which do not give the due resistance. Besides, the absorbents are, in this case, so far from taking up more than the usual quantity of the exhaled fluid, that they also

participate in the general debility, and are scarcely equal to their usual functions.

527. But, indeed, nature herself has for the most part guarded by a very simple contrivance against these great and numerous dangers; and the blood is neither attenuated so easily as many believe, nor, should that take place, are we destitute of a suitable remedy. For, if the body be otherwise healthy, the thinner excretions are almost immediately increased in a great degree, and the whole mass of blood is often restored in a short time to a proper consistency.

528. Another disorder of the blood, the opposite of this, is excessive spissitude, at least such a disorder practitioners have often imagined to exist, though the instances in which it has been observed, if real, are very few. They have asserted that it proceeds from thick, dry, tenacious, or glutinous food; from deficiency of drink; or from excess of the thin excretions occasioned by heat, exercise, &c. Examples, however, of such a disorder, or of the compound diseases derived from it, are not readily produced. In fact, certain fevers, which medical men chiefly refer to, and inflammations, are accounted for in a manner entirely different.

529. For the human body is so constituted by the great former of all things, that as soon as the blood is reduced to it's just consistency, or the smallest degree beyond it, the thin excretions are either suppressed or diminished, and the body at the same time absorbs more moisture from the atmosphere; then also thirst is excited, and the person is disposed to drink in such quantity as suffices to dilute the blood. But should even water fail, and the wretched patient be prevented from gratifying his urgent and insatiable thirst, even then, so far is the blood from being inspissated, that, by the confession of the very authors who strenuously contend for these theories, concerning the disorders of the fluids, putrescency commencing or increasing, the blood is much dissolved, becomes acrid and thin (525.), and can with difficulty be retained in it's vessels.

530. Medical men have written much on the acri-

mony of the fluids, and have endeavoured to raise a mighty structure on this slender and slippery foundation.

531. In fact, most part of the theories of medical men, concerning the acrimony of the humours, are now obsolete and deservedly neglected as groundless, or at least uncertain and no way of service in medical practice: and serious controversies are now maintained concerning even those acrimonies, which, for a long period, and by common consent, were held to be certain and evident. And it must be acknowledged that even as to these, the putrescence of the humours, for example, there is room for doubt. But in the mean time, while the matter is undecided, it becomes us, when avoiding one error, to guard against falling into another nearly as gross, by neglecting a matter of some moment at least in medical practice, though not of so great importance as was formerly supposed. It is certainly worth while to attend to what is ascertained or most probable in reference to this matter.

532. The blood, which in perfect health possesses some degree of acrimony, may acquire more from various causes, and produce many serious disorders. This is evident from the effects of acrid substances received into the body, in quickening the action of the heart, of the arteries, or the secreting organs; it is likewise evident, from the unusual acrimony of the secreted fluids, from the state of the vessels on some occasions much irritated, on others quite inflamed, or even eroded.

533. Many acrid substances indeed, are daily received into the body; but, in the stomach, the intestines, and the lungs, these are either corrected, digested, or changed before they be infused into the blood of the aorta, to be distributed over the whole system; or at least being diluted with a large proportion of water, or by the addition of fibrine, albumen, and gelatine, they lose much of their acrimonious quality, and, as noxious, are constantly discharged from the body by excretion.

534. In this manner a great quantity of acid, alca-

line, or neutral salts, common salt for instance, may pass through the body, while the health is little or nothing affected. But when the quantity becomes excessive, and is neither properly diluted, nor ejected by excretion, it proves noxious at last.

535. It also seems probable, though there are not a few medical men who entertain doubts about it, that even during life, man has some tendency to putrescence, and that he generates, or evolves a peculiar salt in great quantity (499.), which is not improperly termed animal salt; for a great part of all that we receive into the body is converted into this salt, and passes off with the urine. But when that tendency to a putrescent state becomes excessive, it will also produce this salt in excess, especially when salt is taken plentifully with the food, and there is but little water or other drink at hand, first to dilute it, and afterward to wash it out of the system. This disorder sailors commonly know too well when they are obliged to live many months on sea stores alone.

536. For this corruption of the body (535.), if that which supervenes spontaneously is to be accounted such, nature suggests a suitable remedy; namely, fresh food, especially that prepared from vegetables, which being acescent, corrects the putrescent tendency of the system, and supplies it with salutary nourishment.

537. But when there is a deficiency of such food, the body seems to be more quickly corrupted, and a singular acrimony and tenuity of the fluids are alleged to be generated; especially when at the same time there is a deficiency of water, and the excretions, which convey putrid and acrid matters out of the system, are languid from cold, indolence, torpor, depressing passions, or diseases attended with prostration of strength; or, in a word, when excessive heat is present, which always favours such corruption.

538. Farther, medical men have been of opinion, that on some occasions the fluids had a more rapid progress to putrescency, when a putrid ferment was received into the system; as, in certain fevers proceeding from

contagion, especially when assisted by heat, animal food, certain salts, debility, and want of cleanliness.

539. Lastly, on many occasions, a particular part of the body becomes evidently putrid, from various causes, as inflammation, gangrene, or excessive cold, and sometimes infects the whole system: though for the most part such a disease proves fatal before the whole body can be hurried into putrefaction.

540. It has long been an article of the firmest belief with almost all medical men, that where the mass of blood acquires much putrescency, it not only becomes acrid, but is dissolved, congealed with difficulty, shews a thin and scanty crassamentum, while the red particles are dissipated and broken down; that the blood thus become dissolved and acrid, owing partly to evolving it's peculiar salt, partly to it's fibrine becoming rancid and putrid, consequently stimulates and erodes all the vessels, and escapes from them; that it produces blotches at first red, afterwards livid or black; tumours, ulcers which prove incurable unless the putrescent tendency be seasonably counteracted; haemorrhage from every part of the body, which can scarcely be checked; a singular and intolerable foetor of the breath, and of all the excretions, such as is often observed in the scurvy, and in some of the worst fevers; and that it induces a laxity of the solids, the greatest debility, (the nervous power being injured by such putrescency, as by poison,) and at last death itself.

541. Human blood seems scarcely ever liable to an acid acrimony: the same is the case with all the fluids, when first secreted from it; though indeed milk, which is one of these, after it's secretion spontaneously becomes acid in a short time.

542. Nor does the blood seem more liable to be infected with an alkaline acrimony. Putrescency indeed tends to this, and at last terminates in it, but scarcely while life remains; however, urine, one of the secretions, even when newly discharged, frequently approaches the nature of an alkali, and is said to be discharged in some cases entirely alkaline.

543. Various kinds of acrimony may possibly exist in the blood, from the excessive use of many acrid substances, such as spices or strong liquors; but of these nothing certain is known.

544. Various morbid acrimonies, however, certainly exist; which often appear in some measure to infect the body, and corrupt it with various diseases; such are the acrimonies of the small-pox, the measles, cancer, and lues venerea, of all which the nature and origin are little understood, or the manner in which they prove so noxious; but their effects are too well known.

545. Against the most part of these acrimonies, however, nature has guarded with equal care, as against excessive spissitude of the blood: by furnishing an antidote to some of them, or by exciting thirst, that by drink they may be properly washed out of the system; by increasing the suitable excretions that they may be ejected; or, finally, by exciting various motions and actions by which they are subdued, changed, rendered harmless, or by new and unusual channels and excretions, are expelled from the body.

CHAP. XVII.

Of respiration; it's uses, varieties, and disorders; of voice, speech, effort, sighing, yawning, laughter, weeping, hiccup, difficult breathing, cough, and sneezing.

546. THERE remains yet another function to be considered, that of respiration, justly accounted a vital function; since, in man, and animals of a similar structure, it is so necessary to life, that it cannot be suspended even for the shortest space of time, without the greatest inconvenience, or instant danger (5.)

547. It does not exist in the foetus, but commences immediately after birth; it is performed by a twofold motion, namely, inspiration and expiration; by the one the air is received into the lungs, by the other it is again expelled from them.

548. From the observations of medical men, it is now ascertained, that the lungs are immediately contiguous to the pleura of the ribs, and that no air is interposed between them, as was formerly supposed: therefore, when the thorax is enlarged, either a vacuum must take place between the pleura and the lungs, or the latter must also be so distended, that they may again completely fill the cavity of the thorax.

549. A vacuum is prevented by the elasticity of the air, and thus the volume of it in the lungs is increased; it is also prevented by the pressure of the external air entering by the wind-pipe, and having free access to the internal air; on which, now somewhat expanded during inspiration, and, of course, making less resistance, it presses in every direction through the lungs.

550. There is a twofold contrivance by which we en-

large the cavity of the thorax; either by contraction of the diaphragm, which descends, drawing it's centre downwards, and converting nearly into a plane the surface which was concave, towards the abdomen;—or by contraction of the intercostal muscles which elevate the ribs; but, on account of the oblique position and articulation, which these have with the spine, they cannot be elevated, without being protruded, so as to bring forward the sternum at the same time, and to move the opposite sides of the chest somewhat farther from one another.

551. These powers, then, singly or jointly, as circumstances require, we are in the habit of using, to enlarge the thorax in all directions, rendering it longer, broader, and deeper.

552. But other muscles also contribute to very powerful or difficult inspiration, that is, all those muscles which can either elevate the superior ribs, or keep them steady, that the inferior ones may be drawn to them with the more powerful and certain effect.

553. The thorax thus dilated is soon reduced to it's former amplitude, particularly by the relaxation of all the muscles of inspiration, the proper elasticity of the dilated parts conducing greatly to this effect. For in this way the ribs, joined by means of cartilages and strong ligaments to the spine and sternum, return almost instantly to their first situation; spontaneously indeed, and with the utmost ease, without any voluntary effort, or the involuntary contraction of any muscle. The mediastinum too, is said to draw the centre of the diaphragm upward; and the muscles of the abdomen, distended by inspiration, not merely by their elasticity, but being contracted by the vital power, (306, 321.) press the diaphragm upwards, and draw down the ribs; in this manner the air is again expelled from the lungs, assisted at the same time by the contraction of the muscular fibres with which the bronchia are furnished.

554. But in a strong expiration, other muscles also assist, such as depress the ribs, or those muscles of the ab-

domen, which being under the controul of the will, may be contracted with great force.

555. By these alternate powers, then, respiration is performed. It has long been a matter of much controversy among medical men, to what extent the thorax is enlarged during inspiration, or what measure of external air is received into the lungs at each inspiration; nor is the question as yet fully decided. There are not wanting many observations and experiments, instituted by various authors, which render it probable that an adult person of the usual stature, (for the amplitude of the chest, is of great importance in this case,) in an ordinary inspiration, receives into the lungs about forty cubic inches of air; that after a natural expiration, there remain in them above a hundred cubic inches; after a very violent expiration, scarcely fifty cubic inches of air remain in the lungs; by an inspiration made with the greatest force, perhaps two hundred and fifty cubic inches are included in them; and, in short, by a very powerful expiration succeeding such an inspiration, nearly two hundred cubic inches of air are expelled from the lungs.

556. Respiration holds an intermediate place between voluntary actions, and those which are performed without a person's consciousness or consent. Nature has made sufficient provision that it may be always exercised, so far as it is necessary to life; but so far as it is subservient to a great number of different occasional functions of the living body, it is subjected, in some measure, to our will and choice. All the muscles of respiration appear to be subjected to the controul of the will; but nature has supplied a suitable and incessant stimulus to excite them to the requisite action, not only when man is unconscious, but when indisposed to it, or exerting himself against it.

557. What that stimulus is has been a matter of much research to medical men; also why the infant, which never breathed while in the womb, immediately begins to respire as soon as it is exposed to the air.

558. That respiration commences immediately after

birth, is by some ascribed to a peculiar natural instinct: others ascribe it to a general effort which the new animal makes; and, in fact, every effort of any vigour requires an inspiration, that the parts to which the great muscles of the body are attached, may have due steadiness; in a word, others attribute the first breathing to the contraction of the diaphragm itself, which, though greatly distended, and ready to contract powerfully with the first opportunity, could effect nothing at all while the child was in the uterus, because the circumambient fluid was not air, but an aqueous liquor, which cannot enter the glottis, but shuts up it's aperture in the closest manner, by exciting it to powerful contraction.

559. To the first inspiration succeeds an expiration, made by the powers already enumerated (553.); and to this again an inspiration, effected partly perhaps by the simple contraction of the diaphragm pressed upward, and considerably distended by the action of the abdominal muscles; perhaps, also, in part by the stimulus which is communicated by the blood collected in the arteries and veins of the lungs; but most of all, by that peculiar stimulus given by the air retained in the lungs, impregnated in respiration with various substances, (59, 564.) or probably otherwise depraved (565.) and which seems to be communicated by sympathy (358.) to all the muscles of respiration. In ordinary respiration we scarcely perceive the last mentioned stimulus, because it is familiar to us; but if we repress our respiration for a little while, we perceive it becoming irksome, very powerful, and irresistible.

560. Farther, inspiration requires a degree of effort of which we are conscious; expiration is accomplished spontaneously, and without effort (553.) Hence, the the last exertion of the dying, is an inspiration; he breathes out his soul without an effort, for all die in the act of expiration.

561. Respiration serves various purposes. The greater part of medical men have viewed it, as not useful only, but absolutely necessary, because, in their opinion, it is necessary to promote the circulation of the blood

through the lungs. For the lungs, while collapsed and compressed as they are in the foetus, and even, as some think, in the adult during exspiration, cannot admit so much blood as the right side of the heart delivers to them. In the foetus, therefore, this blood has another course; but, in the adult person, where no other passage is open, they suppose that the blood is in some degree accumulated in the lungs, and produces first a disagreeable, though slight feeling of uneasiness, with a desire of inspiring; but afterwards, unless one draw his breath, it brings on a horrible feeling of suffocation. They were also of opinion that it does not pass much better through the lungs during inspiration: for although a somewhat larger quantity of blood might in this state be admitted into the lungs, they supposed that it is transmitted with difficulty, because the very minute branches of the pulmonary artery are too much compressed by the distended cells of the lungs. But all these things, though not entirely false, are at least not well established, and of less moment than many grave authors have supposed.

562. But if facts are as these authors have taught, there ought to be some state of the lungs intermediate between compression and their greatest enlargement, which would receive and transmit the blood freely; and which would render the blood-vessels of the greatest possible capacity. But it is evident now from suitable experiments, that a compression of the lungs effected by water poured into the thorax of the living animal, a compression much greater than is made in an ordinary expiration, has little effect in impeding the circulation through them, and does not disturb the breathing so much as was formerly supposed.

563. But even that necessity, supposing it real, nature could have avoided, either by giving man no lungs, or by furnishing him with a simple heart, and a kind of arbitrary lungs receiving all their blood from a branch of the aorta, such a structure as we see in amphibious, or in most part of cold-blooded animals. Besides, the laws of philosophising forbid us to search for, or con-

ceive more causes than are sufficient to explain the circumstances. There are other reasons, no way dubious, why life would be quickly extinguished by the interruption of the breathing, during either inspiration or expiration, or, in short, during that intermediate state in which the vessels ought to be most capacious and free.

564. We learn other uses of respiration from it's effects. All animals that respire, besides an aqueous vapour, always exhale a great quantity of carbonic acid from the lungs, which would prove a deadly poison to themselves or others, if retained in the lungs, or drawn into them again. Nor is it a trifling use of respiration to discharge such a noxious substance.

565. It is evident also, by innumerable experiments, that a great and very important change on the blood takes place in the lungs by means of respiration. For that returning from all parts of the body by the venae cavae, in colour inclining to black, is impelled through the right side of the heart into the lungs, and during the respiration of the animal, becoming of a brighter red, (a circumstance long known,) and otherwise changed, returns to the left side of the heart, and powerfully stimulates it to it's proper functions. But when the breathing is interrupted, the blood transmitted from the lungs no longer possesses it's accustomed redness, nor does it sufficiently stimulate the left side of the heart, the motion of which immediately becomes defective, and by and by is destroyed. When the respiration of the animal is restored, the blood conveyed from the lungs to the heart, resumes it's redness, and the motion of the heart it's vigour, at the same time, and the dying animal is revived. These chemical changes on the blood in the lungs seem chiefly to depend on oxygen, (which is only a small portion of the common air which we usually respire,) received in some way into the blood, and thoroughly combined with it.

566. Farther, such an exhalation of carbonic acid as takes place from the lungs, (564.) is by chemists held to be a certain evidence of some change of composition in the body whence it proceeds. And it is probable

enough, that the blood undergoes some other chemical change there, of which the exhalation of that acid is the evidence and effect; especially, if we attend to the circumstance, that all the nourishment passes through the lungs before commencing the great course of the circulation; and that, in a healthy person at least, no indigested substance is ever found in the blood transmitted by the left side of the heart to the rest of the body. Perhaps the crude matter, such as it is taken up from the intestines, oily, sweetish, acescent, of a nature, in some measure, intermediate between vegetable and animal substance, is in the lungs reduced, and converted into true blood, (302, &c.) completely concocted; in fine, assuming the animal character, it becomes putrescent, and is no longer to be distinguished from the former humours of the body.

567. In fine, some are of opinion that animal heat is somehow generated in the lungs. In other cases, while heat is produced, carbonic acid is formed in great quantity, the oxygen of the atmosphere being consumed and combined with carbon. We learn this especially from flame, in which the heat is great, and at the same time a great quantity of that acid is evolved. The same thing is evident from that gentle heat, which in many cases arises during the process of fermentation of manure, while it gradually putrifies in the heap.

568. That poisonous vapour, from whatever it be derived, appears to be almost uniform, whether it be the product of respiration, of fire, or fermentation. It extinguishes both life and flame: that part of it which consists of carbonic acid, is attracted by quicklime; but what remains, being azote without oxygen, is nevertheless destructive to life and flame.

569. Again, the warmer the blood of animals is, they are observed the more speedily to corrupt the air which they respire, and to consume it's oxygen; and the more perfect their respiration is, they possess the greater heat. Thus, the heat of worms which breathe through spiracles in the skin, is scarcely one degree of Fahrenheit's thermometer above the element which they inhabit;

that of fishes, which are provided with gills, two or three degrees; that of amphibious animals, which have arbitrary lungs, a little more. In all these the heart is single, the pulmonary artery derived from the aorta, and the breath which slowly corrupts the air or water in which they live, and the blood are cold, at least much colder than ours. Also in many, perhaps in all animals of this kind, the heat may vary much according to the temperature of the air or water in which they live, as we learn from not a few experiments instituted by the celebrated John Hunter.

570. But as for those animals which are furnished with a double heart, whose whole blood passes through the lungs before it return from the venae cavae to the aorta; whose respiration being constant, and loaded with much carbonic acid, cannot be interrupted even for a short time without hazard of life; all these without exception, man, quadrupeds, birds, the cetaceous and seal tribes, whether living on land or water, have warm blood; being about an hundred degrees of the above mentioned instrument. Nor indeed does their heat vary much, whatever be the variation of temperature of the air or water in which they live.

571. Lastly, certain insects, which breathe or at least which quickly corrupt the air to a great degree, possess the same heat; this holds particularly in the case of bees, the individual heat of which can scarcely be ascertained, but the heat of the swarm is little inferior to that of the human body.

572. This opinion, however, like others respecting the origin of animal heat, is not without it's difficulties: because heat is always nearly the same, whether the surrounding air, and that which we breathe (570.) be very cold or very hot; inasmuch, as the greater the supply of heat which is required, the more abundantly we furnish it to ourselves; and the less we need the less we generate. Moreover, the warmer the air is, and the warmer man himself is, the more frequently and fully he respires.

573. In fine, some strenuously argue, that on some

occasions, the body not only does not generate heat, but in reality generates cold, and thus preserves itself much more cool than the warm air which surrounds it; as if one should continue some considerable time in an oven or vapour bath, with very little addition of heat.

574. It cannot be doubted, that evaporation even from the skin, but much more from the lungs themselves, must have a great effect in moderating the heat of the body, from whatever source it proceeds: and it is no way improbable, that this evaporation may on some occasions more than compensate the heat generated by respiration, and of course render the body in fact more cool.

575. Yet it must be confessed, that much is yet required to prove and establish this doctrine. Many very beautiful experiments have in our times been instituted on this subject, which induce the conviction, that chemists have at last entered on the proper path for unveiling and laying open this arcanum of nature, the path which philosophers and physiologists, both formerly and of late, had sought in vain. Nor is it any matter of surprise, that a field so wide, and so lately opened to research, should not yet be so far examined as to give us a perfect knowledge of it.

576. Many formerly, and of late, have rather inclined to the opinion, that the blood elsewhere heated, was cooled in the lungs; because we expire the air warm which we had inhaled cold.

577. Medical writers have also assigned not a few other offices to the lungs; such as forming and polishing the red globules of the blood, absorbing from the atmosphere many things necessary to life, particularly oxygen, and the like. But of these nothing certain is known, nor indeed have they great probability.

578. Respiration in it's natural state, is usually regulated at the rate of about four strokes of the heart and arteries in the time of one respiration. If the pulse become more frequent, the respiration also is quickened, or, if the pulse be checked, it is retarded. But such correspondence is not always observed; for in children

whose pulse is very frequent, the breathing is not so quick; the same thing is sometimes observed in fevers. But in difficult and laborious respiration, twelve or more pulsations may be observed during the time of one respiration. Farther, by the mere controul of volition, we may easily protract a single respiration till the pulsations have reached three or four times the usual number. Divers, it is said, learn to repress their breathing ten times longer than other men.

579. We have the controul of all the muscles of respiration, every one of which is subservient also to other purposes (331, 334, 556.)

580. In the first place then, every animal furnished with lungs, is endowed with a voice, by which it expresses it's various desires, and other mental affections. Now this is effected by air passing through the glottis, which is more or less constricted, with such force, that it produces certain tremulous motions of the cartilages and ligaments of the larynx, such as produce sound, and affect the air itself. The voice also becomes stronger, clearer, and more agreeable, while it passes through the mouth and nostrils, being assisted by the bones, the cartilages, and even the membranes of these parts, which, by repercussion, increase the sound which they had received. Besides, the voice is varied, not only according to the varieties in the aperture of the glottis, but according as the whole larynx is more constricted or more lax, depressed or elevated ; and numerous minute muscles concur to the accomplishment of these purposes. All these statements are fully proved by the structure of the parts themselves, as laid open by the dissecting knife ; and indeed by the sight and touch of the throat, or of the nose, during the act of utterance ; and from the fact, that the voice itself is corrupted in various and surprising ways, owing to the disorders which are said to affect these parts.

581. Man alone is endued with speech, being the only one capable of using that admirable gift. Many animals have indeed learned to speak, but none to use speech ; doubtless, because the requisite mind

was wanting. Speech is accomplished by means of the tongue, the lips, the gums, the teeth, the velum pendulum palati, the bone of the palate, the nose, and the throat, all contributing their aid in various ways. By this contrivance, the voice being interrupted and changed, is formed into distinct letters or elements; these we learn in early life, as it were by instinct and imitation, while not yet conscious of the labour, or of the manner in which we articulate single letters.

582. But the method of pronouncing every letter, and the mechanism of the parts by which it is formed, are discovered by attentive observation; nor is such a labour of small consequence to mankind: for by this knowledge we are enabled to correct various disorders of speech. Nay, there are persons whose sole employment is to teach the dumb to speak. The greater part of these are born deaf only, not defective or imperfect in the organs of speech, and merely are unable to imitate words, of the existence of which they are not apprised. In like manner, if by any accident children, who have already learned to speak, become deaf, they usually become dumb also. But now, the deaf, whether by nature or by disease, and of course dumb, may, by the touch and sight of the organs of speech, while one is speaking, learn to distinguish the letters, and at last to pronounce them with their own organs: the work indeed is truly irksome, but attended with a noble reward.

583. Besides, the muscles of respiration give their aid to various actions of the abdominal viscera. They seem to promote the circulation through the abdomen itself, especially through the liver, by the alternate and vigorous motion with which they are frequently agitated. For when the diaphragm and the muscles of the abdomen are contracted at the same time, the whole abdomen and whatever it contains are squeezed as in a press. These powers are for the most part necessary to the evacuations by stool and urine; especially for overcoming the resistance of the sphincters of the bladder and anus; for when this is overcome, the contrac-

tile force of the intestines and bladder are adequate to the expulsion of the urine and faeces ; for a like reason they promote parturition, and concur with the disorder and nausea of the stomach to produce vomiting.

584. Besides, inspiration, while it distends the thorax, if the breathing be at the same time repressed, fixes the shoulders, back, and neck, and thus affords a more steady fulcrum to the most powerful muscles of the trunk and arms, such as is requisite in every violent effort.

585. In fine, certain affections of the respiration, not properly morbid, point out the state both of the mind and body, and often without the person's consciousness or consent.

586. Sighing is a full expiration, made with such force as to be heard by the bystanders. It is often preceded by an inspiration unusually strong and full. It is occasioned by the difficult progress of the blood through the lungs, owing to an enfeebled action of the heart and other moving powers. Hence it is an attendant of many diseases ; and familiar even to those in health, when the strength is exhausted with long watching, or excessive labour. In short, it is often an index of the state of the mind, so far as it derives it's origin from grief, fear, or any other passion which impairs the bodily strength.

587. Somewhat akin to this is yawning, so far as it proceeds from a more languid circulation through the lungs ; so that with small impropriety the one might be substituted for the other. Yawning is a large, full, sonorous inspiration, with the mouth wide open, which is usually quickly succeeded by an equal expiration, and sometimes accompanied with a vigorous extension of all the limbs, which is commonly termed pandiculatio. The affection is familiar to the hungry, the drowsy, or those exhausted with toil and watching; it is frequent with hysterical patients, and even among persons in perfect health, it is often propagated in an astonishing manner by contagion or imitation.

588. Laughter is a full inspiration, to which succeed

repeated, interrupted, and very sonorous expirations, so that the breathing is sometimes almost cut off, or the blood-vessels of the lungs, being distended beyond measure, are ruptured, not without great danger of suffocation. It proceeds for the most part from some new, slight, agreeable affection of the mind, which is ludicrous, and difficult to define; or from a tickling of certain parts of the body, which have a very keen sensibility. When violent, it is not without danger; when moderate, it is accounted salutary; for it promotes the circulation in an agreeable manner, and agitates and rouses the whole body; and what is perhaps no less to the purpose, shews the mind to be free from overwhelming care. Laughter is attended with a cheerful expression of countenance not easily described.

589. Weeping, it's opposite, if we contemplate the exciting cause, differs little in the mechanism of the parts by which it is effected. This also consists of a full inspiration, and of short, broken, sonorous expirations, with a loud, querulous, and unpleasant voice; at the same time, the countenance is sorrowful and tears flow. It proceeds for the most part from some depressing affection of the mind, particularly grief, and has usually considerable effect in alleviating it; at least, it is the best protection against the dangers attendant upon such an affection (61, 346.). Children also often cry on account of bodily pain. It is seldom dangerous, except in some cases to infants, whose laughter or crying, though arising from the most trifling causes, are more violent than those of adults. With hysterical persons both are very frequent and immoderate, and, it would seem, not without some cause, real or imaginary, though this cause they are often unwilling to explain. Both are peculiar to man, perhaps because they proceed from affections of the mind, of which brute animals are destitute.

590. With the preceding we should perhaps class hiccup, which often affects those who enjoy good health, as when it follows an immoderate fit of laughter; although, on many occasions, it is also morbid, and in

some diseases a very alarming symptom. But it is nothing else than a sudden and sonorous convulsion of the diaphragm; the stomach too, it appears, is sometimes convulsed. Besides the above mentioned violent action of the diaphragm, it's most frequent cause is some irritation of the stomach. The mere distension of that organ often induces hiccup: hence it is common with persons intoxicated, or in a surfeit. It usually accompanies inflammation or gangrene of the stomach or intestines. It is often found extremely troublesome in a state of debility, toward the end of chronic diseases, or in palsy, or after extracting a stone from the bladder, if the patient has not a good recovery. Sometimes also, by continuing long it acquires as by habit (369, 80, 87.) a possession, from which it is very difficult to dislodge it. The cause is often very obscure.

591. Farther, respiration is often more or less obstructed in various diseases, to the great inconvenience, or not seldom the danger of the patient.

592. Dyspnoea is the name given by medical men to the disorder of respiration, when at any time the breath is not drawn fully, or without pain, but laboriously, and with more than usual difficulty: a disorder which is in fact very frequent, the attendant, or constituent part of many diseases.

593. It is induced by various causes, on account of the great number of organs which are subservient to respiration, and are connected with other parts; also on account of many external circumstances, especially in relation to the atmosphere, as it's qualities, density, rarefaction, temperature, &c., which may be corrupted in various ways.

594. Respiration, then, may be affected in a very healthy person, by many faults of the air: as by it's excessive levity, especially if the change be sudden, it's rarefaction, humidity, impurity, corruption; particularly when it is loaded with noxious, acrid, or poisonous vapours, the power of which is sometimes so great, as not merely to impede respiration, but in a short time to extinguish life itself.

595. Farther, those various obstructions, whether proceeding from a mere tumour, from inflammation, or contraction of the mouth, the nostrils, the throat, the glottis, the wind-pipe, or the bronchia, which in any way close the channels by which the air ought to enter, all impede respiration.

596. It is likewise impeded by every disorder of the lungs, when they are inflamed, obstructed with tumours, or inundated with much water, mucus, serum, or blood, and do not admit of being duly dilated.

597. Supposing the lungs to be sound, and all the channels of access to them to be quite clear, when the thorax itself is filled with water, blood, pus, or even with air admitted through a wound, the enlargement of the lungs, and of course respiration, is impeded. A wound even in one side of the thorax, by opening a channel for the admission of air, when the chest is enlarged, different from the windpipe, obstructs respiration: but if the wound penetrate both sides, it suppresses it in a short time.

598. A great variety of disorders also of the organs that enlarge the chest, such as debility, palsy, spasm, inflammation, pain, and rigidity of the diaphragm, or of the abdominal or intercostal muscles, renders the respiration imperfect and difficult. Again, supposing all the moving organs sound, if their action be in any way impeded, so that it does not effect the due enlargement of the chest, the respiration will be rendered difficult; as, when the ribs become rigid, admit of little or difficult motion; or, when the descent of the diaphragm is obstructed by any distention of the abdomen, the uterus, the intestines, or the stomach, owing to water or air, food or drink, or the foetus; by the increased bulk of any viscus; or in short, by the unusual upward pressure of all the viscera: hence all the chief difficulties affecting the respiration of a patient confined to bed.

599. In fine, the organs of respiration, both the great muscles, and, it would appear also, the minutest fibres with which the bronchia are furnished, by consent with

other parts, especially the stomach, are sometimes either convulsed and hurried into irregular motions, or become inadequate to their usual motions: whence proceeds obstructed respiration.

600. Lastly, the difficult transmission of the blood itself through the lungs, whether owing to the injured structure, or any other fault of the organs of circulation, or to debility of the moving powers, often produces difficult and laborious breathing, such as takes place at the point of death.

601. When so many and so different causes of impeded respiration, which by turns induce and aggravate one another, are thoroughly understood, it will be easy to assign the reason, why the disorder is so frequent, and the attendant and symptom of so many diseases; why it is often a disease of the nervous system; why it is at one time slight and temporary, at another severe and incurable; in some hereditary, sometimes dangerous and suddenly fatal, at other times attended with no danger; why it often recurs at intervals, is induced by heat and by violent exercise, or, by moderate exercise, is in some cases relieved; why it is exasperated by plethora, and often relieved, if not cured, by venesection.

602. Obstructed respiration, from whatever cause, more or less impedes the circulation, and, at the same time, obstructs in some measure the expulsion of noxious matter from the lungs, and that salutary and necessary change (564, 5.) which is effected in the blood by means of respiration in it's natural state: hence proceed general debility, various obstructed functions, and many diseases, particularly of a dropsical nature (468, 472.). The lungs being likewise sometimes compressed, and never duly dilated, give out their vapour imperfectly and with difficulty; hence they become oppressed with a watery fluid: besides, they are at the same time irritated, and their mucus secreted in larger quantity, and of greater tenacity, which at last obstructs the channels by which the air enters, stimulating and exciting a violent and troublesome cough, by which at length the lungs relieve themselves.

603. This vital function is also liable to other disorders, namely, coughing and sneezing, which, though at first sight they may seem very oppressive, nevertheless have their uses, and are often and deservedly ranked among the most salutary efforts of nature (65, 70, 364, 368.); yet they are often attended with danger and considerable inconvenience, whether viewed as too violent, or as inefficient and not wisely directed efforts (70, 368.). But whatever opinion be formed of the matter, it is the business of the physician to know the nature, causes, and effects of these affections, that he may the better know how to promote what is salutary, moderate what is excessive, and repress what is noxious or unsuitable.

604. Coughing is a violent sonorous expiration, often involuntary, forcibly and suddenly expelling the air through the glottis, then shut with more or less firmness. A convulsion of the expiratory muscles gives a violent impetus to the air; the contraction of the glottis produces the sound. A cough is often repeated, and becomes lasting, with alternate inspiration after every expiration, but the former is difficult, obstructed, and imperfect, on account of the contraction of the glottis.

605. Coughing is excited by any matter, chemically or mechanically sharp, applied to the passages by which the air enters, from the glottis to the lowest part of the lungs. These passages are lined with a most delicate membrane, so impatient of every stimulus that it cannot endure the touch of the blandest substance, such as a small drop of water, without immediately hurrying the expiratory muscles into a violent convulsion, while the glottis is shut at the same time on account of the sympathy (358.), whereby these parts, discharging an office in common, act simultaneously. Hence the air is expelled with such violence, that it opens the aperture of the glottis, however powerfully closed, and often separates and ejects the irritating matter, whatever it was, which excited the cough; thus it is not only a useful action, but a necessary protection to life, since it alone relieves

the lungs from the irritating cause, or from a load by which the person, in a short time would be suffocated.

606. Every thing unusual in these passages, as mucus in excess, too thick, too thin, or acrid; blood, serum, pus, or water, excite coughing; it is generally an inseparable attendant on every inflammation of the lungs, and every case of more difficult respiration. There are also many cases in which the wind-pipe and bronchia, become too sensible or inflamed, or are deprived of their mucus, which usually defended them from the air itself, when not even the purest air can be breathed without pain, irritation, and violent coughing. In fine, instances are not wanting, in which a frequent and very troublesome cough has been excited, by the disorders and irritation of other parts, or of the whole nervous system:—in some cases it is occasioned by irritations of the ear, worms in the stomach and intestines, or inflammation of the liver.

607. Coughing may also be excited voluntarily, and is then regulated at pleasure; and often when it is entirely involuntary, we may moderate it, or, by a contrary effort, suppress it; if, however, the propensity to cough be violent, it cannot be resisted.

608. Once excited, it usually goes on till either the irritating cause be expelled, or the feeling of irritation be destroyed, allayed, or perhaps overpowered by a severer feeling produced by the cough itself: then when the irritation returns after some interval, the cough returns anew: hence we learn a method by which we frequently relieve and allay this extremely troublesome disorder, though it may not be in our power entirely to remove it's cause.

609. When very violent it is often dangerous: for by the interruption of the breathing, and powerful effort, a great congestion of blood takes place in the lungs, the vessels of which are distended, and sometimes ruptured, producing a great, or perhaps a fatal haemorrhage; but more frequently it proves the origin

of a disease more slow but scarce less fatal: because a frequent and troublesome cough, though not attended with severe, or even with any haemorrhage, may nevertheless injure the lungs to such a degree, especially if they be of a more delicate structure, as to lay the foundation of incurable phthisis.

610. In fine, when the passage of the blood through the lungs is obstructed by long and violent coughing, it regurgitates in the veins, especially toward the head; hence the face, and sometimes the eyes become red, or frequently livid; hence cases of haemorrhage from the nose, or effusions from the internal vessels in the brain itself; hence also, palsy, apoplexy, or convulsion, which sometimes terminate fatally.

611. Lastly, by compressing with great force all the abdominal viscera, if any part be weaker than usual, it may occasion hernia, prolapsus, abortion, or similar disorders.

612. Again, if the cough be rather slight, but frequent and troublesome, though none of the above consequences are to be dreaded, it is not without danger: it doubtless agitates and fatigues the patient, impairs his bodily strength, breaks his sleep, increases fever, shakes and irritates the lungs themselves, impedes the concoction of the food, and the other functions in general, and at last becomes insupportable.

613. Sneezing is very much akin to coughing, being a large and full inspiration, to which succeeds a sonorous and very violent expiration, so directed, that the air is expelled with vast force through the mouth and nostrils, which it sweeps in it's passage. The convulsion itself is much more vehement than coughing, and scarcely admits of being excited or imitated at pleasure; if the propensity be strong, it is restrained with the greatest difficulty, agitating and exciting the whole body more than coughing.

614. As coughing originates in irritation of the glottis, the wind-pipe, the bronchia, or the lungs, so sneezing for the most part proceeds from the irritation of the

membrane of the nostrils; less frequently from consent with parts remote; in like manner, as in coughing, it removes or wipes off the cause of irritation, and therefore is frequently beneficial to the system; but on some occasions it is injurious, especially when too violent, frequent, or of long continuance.

CHAP. XVIII.

Of digestion.

615. By it's various actions, both animal and vital, the body is in a short time exhausted; the fluid parts being dissipated, the solids worn down, and both perhaps of their own accord verging somewhat to putrescence. (6, 539.)

616. But we are admonished and incited by a most importunate appetite, and directed by instinct, assisted by taste, smell, and experience, to receive into the body such substances as are suited to repair it's loss, and prevent or correct it's corruption.

617. When the stomach has been emptied, and the body somewhat exhausted by abstinence, and the accustomed labours of life, there arises an unpleasant sensation, which we refer to the stomach, with a desire to eat, slight at first, but, if not allayed by suitable food, gradually increasing, till it be insupportable and irresistible. This appetite is called hunger.

618. When the fluid parts have been much dissipated, or when any acrid or too dry food has been received into the body, the fauces become parched with a peculiar and unpleasant sensation, and at the same time a great desire of drink is produced. This appetite is called thirst.

619. Hunger may indeed be produced by other causes beside an empty stomach; any evacuation of the whole system, chiefly excessive perspiration, conduces greatly to that effect (357.) Farther, a certain contraction of the muscular fibres of the stomach itself, seems to enter into or to produce hunger (617.): for many stimulants, on being received into the stomach, and it's

moderate distension, excite appetite in one who otherwise would not feel it; gormandizers often experience this, not without serious injury to themselves.

620. Farther, if the food received be entirely fluid and thin, the body is not sufficiently nourished or refreshed: Nature, therefore, has taught man to search out and desire food of a drier and more solid consistence, which may be taken along with fluids, though this be often unsavoury, and possessing little of a nutritive quality.

621. All food is derived either from animals or vegetables. Man has by nature an appetite for both: and by either, or both together, which last is the more common and better mode, he is nourished in an adequate and salutary manner; though some, supposing themselves wiser than nature, forbid animal food to appear on the table, and direct us to live on vegetables alone.

622. Certain fossil substances, and many vegetables, which contain little or no nourishment, are used for seasoning. Such seasonings, every animal, and especially man, eagerly covets, as containing something agreeable to the taste, or at least acrid, though in itself frequently rancid, fetid, or very unpleasing, till habit teaches him to relish it. Nor are such condiments without their use. They stimulate the tongue, exciting it's powers of taste, giving a more agreeable flavour to the food which perhaps possessed little taste: they likewise assist the digestion, by stimulating the stomach, especially when it is weak; neither will digestion go on well, if the seasonings to which one is accustomed are witheld.

623. Except the solution of it's solid parts, animal food requires little concoction or change to fit it for the nutrition of the body, because it already differs little from the human substance. Oils, however, both animal and vegetable, which contain much nourishment, differ considerably in their properties, from the flesh or juices of the human body. Still farther removed are the mucilaginous vegetables, or those which afford farina or sugar, and most of all roots and

leaves, by which, however, every animal is nourished, either by feeding directly on vegetables, or on such animals as are thus fed.

624. We receive the food with our lips; with these, with the cheeks and tongue, we roll it in the mouth; we divide, we bruise, and grind it with the teeth; by an abundant flow of saliva, mucus, and other fluids of the mouth, owing to the stimulus furnished by the taste of the food and to the motion of the parts during mastication, the food is reduced to a soft mass almost fluid, which we transmit to the pharynx, and after this have it no longer in our power: nor is there any farther need of our controul; for by the contraction of the pharynx, it is impelled into the oesophagus, which it dilates and stimulates to contraction; which contraction commencing at the pharynx, and being propagated to the stomach, conveys the food to the latter, where it requires to be detained for some time. The food does not, however, descend so much by it's own weight, as by the contraction of the oesophagus: for many animals swallow upwards, which man himself is also capable of doing.

625. But the food does not immediately pass through the stomach, being detained there some short time by the contraction of the pylorus, which is at the same time somewhat elevated, owing partly to the fibres which surround it, partly to those longer fibres which occupy the superior part of the stomach between the cardia and pylorus; but at length, the pylorus being again relaxed and descending, the food is transferred to the duodenum, now much dissolved, and by the action of the stomach, comminuted, agitated, and propelled.

626. A similar mass of aliments, without the body, composed of a mixture of animal and vegetable matters, being softened into a pulp, and diluted with water or saliva, and at last heated to the temperature of the body, immediately begins to ferment: an internal motion commences, it exhales a great quantity of air, becomes first acid, then putrid.

627. That the same thing often takes place in the living subject is evident from eructation, pain of the stomach, and the acid or putrescent matters discharged by vomit; disorders familiar to persons whose digestion is bad.

628. Again, not a few experiments instituted on purpose, have shewn, that in the stomach even of a very healthy man, the aliments always ferment a little; and, that a few hours after dinner, the whole alimentary mass is become acescent.

629. It must, however, be acknowledged, that either no evidences, or at least very slight ones, of any such change have ever shewed themselves in a healthy person: and it is well known, that the more violent the fermentation is in the stomach, the person's digestive powers are the more feeble and slow.

630. It seems, then, that there is something in the stomach which remedies that inconvenience, and prevents the fermentation of the aliments from making any considerable progress. The gastric juice seems to accomplish this, when copiously secreted. But if the food be detained in the stomach for an undue length of time, a circumstance scarcely compatible with digestion otherwise good, this juice is not sufficient for checking that tendency of the aliments to fermentation, which will then shew itself by manifest symptoms.

631. Farther, this juice acts as a solvent on the food, and the stomach does not transmit it's contents with ease to the intestines before they are well dissolved. Nor is the solvent power the same in all animals: in some it operates with ease on animal food, in others on vegetables, and has no effect at all on the other description. But man, and omnivorous animals, which feed promiscuously on plants and other animals, can equally dissolve either kind of food. This is evident from certain experiments made without the body, and with still more clearness and certainty from some lately made on living animals, and even on man himself, by several authors, particularly the celebrated Spallanzani and Stevens. But many vegetables, both hard and soft,

are neither dissolved, nor in any way digested by the most healthy man, unless first ground with the teeth, or broken and bruised in some other way.

632. Nor does our food shew any evident signs of acidity, at least in a healthy body, after descending to the intestines, though it has in some measure been dissolved, and would have quickly acquired acidity if it had remained in the stomach. Perhaps the juice of the intestines, very similar to the gastric juice, may prove a preventive; as also the pancreatic juice, abundantly supplied, resembling the saliva; but especially the bile conveyed from the liver, which does not permit the fermentation to advance in the mass of aliments, or any nearer approach to an acid nature, and, indeed, corrects in a surprising degree, any acidity already commenced. The bile appears farther to advance the dissolution of the aliments by promoting the mixture of the oily with the aqueous parts; and likewise by stimulating the intestines to their due contraction.

633. Therefore, by mastication, and by the solvent power inherent in the fluids of the mouth, stomach, and intestines, and in the bile, the food is reduced into a fluid form, with the assistance perhaps of the native tendency to fermentation which relaxes the bonds of adhesion. Then during the descent of the whole mass through the intestines, the nutritious juice is absorbed by the lacteal vessels, pendulous, or originating with open mouths in the intestines; by these traversing the mesentery, it is conveyed to the thoracic duct, and is taken into the blood, having accomplished it's passage through the lungs, and being changed entirely into an animal substance. While the afflux of moisture is abundant from the intestines, the liver, and pancreas, the mass which remains acquires little more consistence till it reach the large intestines: but being then more sparingly diluted, and having parted with much of it's fluid, it assumes at length the form of faeces, often of such consistence, that they retain impressions of the cells of the colon.

634. We are, however, far from having a complete

knowledge of the changes which the food undergoes in the stomach or intestines. For the nature and powers of fermentation, and perhaps it's various kinds, are not yet well understood, nor can we by that process account for the digestion of food. Neither can mere solution remove the difficulty: for food is not only dissolved, but much changed; and after acquiring new properties, is conveyed into the blood in the form of chyle. Milk itself, the simplest food, and that which has the greatest resemblance to chyle, is first coagulated in the stomach, then digested and dissolved, and like other food, converted into chyle, before it become suitable nourishment for the body.

635. The motion of the intestines is, in good health, very simple, and is called peristaltic. One portion after another is successively excited to contract, partly by the acrimony, partly by the bulk of the alimentary mass, which being at length propelled into the intestinum rectum, stimulates this part, inducing a desire of going to stool, and excites to contraction the intestine itself, with the parts consenting, namely, the abdominal muscles and diaphragm; by this contraction, the resistance of the sphincter ani is overcome, and the faeces are at last ejected from the body.

636. Philosophers and physicians have, indeed, endeavoured to assign a great many other causes of digestion: some attributing the greatest share in it to heat, some to agitation and trituration, and others to fermentation; though they have not vindicated their respective opinions with arguments sufficiently valid. However, the labour bestowed on this matter, has not been lost. They have, at least, accounted for many affections by which this most useful function is often deranged, and have, accordingly, pointed out proper remedies for them.

637. Some kinds of food are digested with ease, others with the greatest difficulty. But in this matter there is a wonderful diversity among men, and a still more wonderful power of habit; so that one man's meat is another man's poison. Farther, the hardy

stomach of a reaper, for instance, will sometimes digest the almost stony food to which it has been accustomed, with more ease than it would the most delicate.

638. Almost all kinds of food which we use are mellowed and softened by fire. Mixture too, fermentation, and a great many seasonings, on different plans, render the food of easier solution and digestion. By this means, the art of cookery is not only agreeable, but in general necessary to those accustomed to it: but when it is employed too much, or to mix and confound matters of opposite and incompatible properties, it does much injury; especially, as by this means, it allures to excess: for, in fact, neither the mixture of different kinds, though by disposing the whole mass to more speedy and violent fermentation, it may do considerable injury on some occasions; nor the quality of food does the gormandizer so much injury as the excessive quantity which he devours. For a man in health, with his usual appetite, will seldom exceed the due quantity of any one simple kind of food; but by variety and sauces, and exquisite cookery, he may be allured to load himself with triple the quantity which he ought to take.

639. The greatest part of hard food, or what has been seasoned or hardened by salt, or smoke, by pepper, or spices; or the glutinous and oily part, either of vegetables or animals, is usually more difficult to digest: the flesh too, of young animals, seems to be of more difficult digestion than that of full grown ones; and the flesh of birds more than that of quadrupeds.

640. But such is the power of the active juice of an empty stomach in different kinds of animals, that it not only dissolves and digests oils, gluten, cartilage, but even bones, and the hardest ivory. It is also said sometimes to corrode the stomach itself, very soon after death.

641. In fine, the above considerations furnish the means of explaining why the digestion is so often injured; why first an acid, and then a putrid corruption of the aliments in the stomach is familiar to persons of weak digestion; why the digestion of the food is sud-

denly disturbed and vitiated, not only in several diseases of the body, but often in any strong mental affection; why exercise frequently promotes, and sometimes impedes the action of the stomach on the food; and why a glass of wine is to many beneficial, and promotes digestion, but to many others is injurious, and deranges it.

CHAP. XIX.

Of the disorders of digestion, and the various morbid affections of it's organs.

642. The appetite for food sometimes fails, from the state either of the stomach, or of the rest of the body. Anorexia, therefore, is the attendant or effect of many diseases: but is not always to be accounted a disease. For gormandizers unjustly complain of the want of appetite, while the body, sounder than the mind, nauseates and refuses the food for which it has no occasion.

643. There is either no appetite, or it is but feeble, while the food which was last received remains in the stomach: hence it frequently does not return after a surfeit till that has been completely carried off. It fails also when ever the digestion is bad; for it is with difficulty that the stomach transmits the food imperfectly digested to the intestines. It is often weakened by want of exercise, by which the whole body ought to have been emptied, (619.) though the stomach be no way diseased, and the digestion good. It generally fails when the perspiration is obstructed, and from such debility of the stomach, as on many occasions is suddenly induced; it is weakened in all fevers; nor is there indeed a more certain symptom of the decline of fever, than the return of appetite. Farther, the defect of appetite, and the abstinence that attends it, is far from being so injurious to the sick, especially those confined to bed in acute diseases, as similar want of food would be to a person in health. Nor must we pass unnoticed, that the loathing of food, which the patient has in the commencement of fever, often proves rather salutary. In that case, nature wisely declines a load, which could neither be digested, nor borne with impunity.

644. Even in healthy persons, the appetite varies considerably; sometimes it becomes surprisingly keen, so as with reason to be accounted morbid. This disorder is rare, yet sometimes observed, and supposed to be occasioned by long abstinence; by great evacuations, requiring more than the usual supply; by some acrid matter generated in the stomach, or received into it, stimulating it to excess; by a diseased imagination; or, in fine, by a bad habit. For it is beyond doubt, that by habit alone, men become more desirous of food, and capable of taking it in a greater quantity.

645. That depraved appetite which consists in longing for something unusual, unsuitable, or not at all of an esculent description, commonly proceeds from a diseased imagination; often from excessive indulgence, especially when too much attention is given to the cravings of a disordered stomach. This seems to be the reason why a disease, which sometimes happens to women as a natural consequence of pregnancy, in which their stomach is usually disordered, becomes exasperated, and produces the more vexation, both to themselves and others, the more they indulge it. It appears very rarely in those cases where the manners of society forbid it's indulgence, and require them even to conceal such irregular cravings; but is frequent and violent, and sometimes directed to matters not at all esculent, where females reckon it rather an honour to them, and when common custom requires every husband to indulge his pregnant wife, when he is constrained by a dread of his wife producing a monster instead of a son; or, in fine, where, if any calamity should happen to the woman, in abortion or parturition, he might be accounted his wife's murderer.

646. Sometimes a violent craving is observed for something unusual, or scarcely nutritious, owing to a peculiar state of the stomach, which craving may, nevertheless, prove salutary: as the desire of absorbents, as they are called, owing to a great acidity in the stomach; of acids, and of every fresh vegetable in the scurvy; or of wine and similar fluids in fever. Cravings of this

kind, if moderately indulged, often prove beneficial, seldom noxious.

647. Thirst, like hunger, is sometimes deficient; at other times is observed in excess. It's absence is scarcely to be accounted a disease, while the health, in other respects, does not suffer, and the digestion continues good; as, in that case, it is probable, the system does not require drink. There are some who never thirst; being of a moist constitution of body, using fluid food, in whom a more abundant secretion of the fluids of the mouth, never permits the fauces to become dry.

648. But if there be no thirst felt, while the parched fauces, furred tongue, and other symptoms, shew that drink is required, that must be accounted a diseased state, and no favourable prognostic, and is in general to be referred to stupor, delirium, or some injury of the brain, by which the patient is rendered incapable of perceiving the stimulus, however powerful.

649. Excessive thirst, a much more frequent disorder, proceeds either from the defect of fluids in the body, as when drink has been long withheld; from the moisture of the body being exhausted by vigorous exercise, by sweat, by diarrhoea, or by diabetes; from some acrid matter taken into the body which provident nature teaches us to dilute with a great quantity of drink, that it may be rendered harmless, as when salt, pepper, sugar, and other seasonings, or even harder and more pungent sorts of food have been taken; from overloading the stomach with indigestible food and drink, a case not uncommon with gormandizers and drunkards; from a suppressed or diminished secretion of the fluids of the mouth, such as is often observed in violent mental affections, fever, or spasm; or, in fine, from the diverting of the thin fluids out of their due course, though there be a sufficiency, or even a superabundance of them in the system, a case exemplified in every species of dropsy. Besides, the various causes which increase the intensity of thirst, may be united in the same patient, and, of course, induce a more severe disorder: as in the greater part of fevers, which are at-

tended with great thirst, owing partly to the dissipation of the fluids or diminished secretion of those which moisten the mouth, partly to the heat, or, in a word, to a very disordered stomach, which neither digests well, nor duly conveys it's contents to the intestines.

650. It is easy, therefore, to explain, why excessive thirst is so frequent; why it is sometimes a salutary instinct of nature, at other times an affection quite useless; why at one time the patient requires a great abundance of drink, and the stomach almost instantly receives it, to be conveyed wherever it is required; why in many cases small draughts suffice, and are more effectual, and the stomach can neither receive larger quantities, nor bear them without inconvenience; why acids, or acescents, ripe fruits, or a little wine mixed with the drink, quench thirst more effectually and certainly, than pure water; and, finally, why thirst, that could not be quenched by nectar, is sometimes carried off by an emetic.

651. Mastication is sometimes impeded or depraved by the various disorders of the numerous organs subservient to it; as by pain, swelling, inflammation, ulcer, debility, rigidity, spasm, or defect, affecting the teeth, the jaws, the cheeks, the lips, or the tongue.

652. From similar causes affecting the mouth, throat, or oesophagus, the action of deglutition, naturally following the last mentioned, is likewise obstructed; as in quinsey, hydrophobia, palsy, or such extreme debility, as takes place toward the end of many diseases, especially fevers: in that case, one of the worst and most fatal symptoms.

653. But even after the aliments have reached the stomach, the digestion is very frequently depraved, generally with greater inconvenience than danger to the patient.

654. Indigestion is occasioned particularly by the undue quantity, quality, or mixture of the food taken, or from it's insufficient mastication; whence the stomach being distended, and oppressed with too great a load, is not capable of either dissolving or propelling it's con-

tents; or the alimentary mass, whether indissoluble or tending to corruption, in a short time ferments, and is depraved, the powers of the stomach being incapable of moderating the tendency of the aliments to fermentation (630.).

655. The very best kinds of food, and easiest of digestion, are often digested with difficulty, on account of numerous disorders of the stomach itself, of the parts that have the greatest sympathy with it, or even of the whole system.

656. Deficiency of the gastric juices, and their various disorders; debility of the fibres with which the stomach is furnished; any such obstruction about the pylorus, as prevents the conveyance of the contents of the stomach to the intestines; too slow motion of the intestines, and their various diseases; general debility of the system, whether owing to disease, to violent mental affections, or to the neglect of exercise; and suppressed or diminished perspiration, whether owing to indolence, to cold, (especially cold feet,) or to a cold and moist state of the atmosphere, often deprave the digestion.

657. From indigestion innumerable diseases originate, neither slight nor of easy cure, though seldom observed to be dangerous: such are oppression, anxiety, pain of the stomach, eructation from air extricated during fermentation, irritating the stomach, and escaping through the gullet; nausea and vomiting, from irritation and distention of the stomach; constipation of the bowels, or diarrhoea, defect of nourishment, general weakness, relaxation of the solids, a dissolved state of the fluids, all the functions impeded, headach, vertigo, syncope, asthma, palpitation, hypochondria, especially if the patient be of a peculiar constitution, sometimes gout, dropsy, or slow fever, such as at last may terminate fatally.

658. The motion of the intestines is sometimes defective, sometimes in excess. Hence costiveness or diarrhoea.

659. Costiveness, which is common to the robust,

and indeed to those in health, when severe and protracted, is not only itself a dangerous disease, but also the attendant, effect, and cause of many others. It proceeds either from the injured structure of the intestines, when they are constricted, closed, or obstructed by spasm, schirrus, intussusception, by calculi or concretions formed in them, or by inflammation; or from the state of the faeces when they are hard, dry, difficult to propel, owing either to the use of too solid food, to deficiency of drink, or to a deficiency of the fluids requisite to dilute the alimentary mass (634.), and moisten and lubricate the intestines; which fluids again, are secreted more sparingly, either by reason of disorders in the secreting organs, which are frequently little understood, as in almost all fevers, at least in the first stages, or because the blood is determined another way, for instance to the skin, as in frequent and vigorous exercise, heat, and profuse sweat. Costiveness is also sometimes observed to proceed from debility, sometimes from paralysis of the moving fibres of the intestines; or, in fine, from want of the usual stimulus, as of the bile, when it is obstructed in the jaundice, or when the diet is too sparing, and not so pungent as to stimulate the intestines in the usual way, and excite them to due action.

660. The excretion by stool, indeed, however putrid and acrid it may seem, is more under the controul of habit than any other, and can be suppressed for a time with less danger. Food commonly passes through the body in about the space of a day: but it's course is often much quicker or slower; for there are some, otherwise in good health, who will scarcely go to stool three times in a month. This depends greatly on the age and constitution of individuals, and on the kind of food which they use.

661. By prolonged constipation of the bowels, the tube of the intestines is first affected, then the whole body. The stomach is disordered, and the digestion hurt, the whole system is unusually excited and heated, which is especially observable in fevers; perhaps the

blood is also corrupted by putrid matter taken up from the intestines. The blood flows less freely through the abdominal viscera; whence, on many occasions, are irregular congestions, dilated veins, effusions of blood into the intestines, and discharge of it by the anus, which disease is called haemorrhoids. Besides, the intestines themselves, distended and irritated by putrid and acrid matter, are stimulated to new and more vigorous motions; which, if inadequate to overcome the obstruction, often induce great pain and gripes, the colic or iliac passion, inflammation or gangrene, which speedily proves fatal.

662. It is called an alvine flux or diarrhoea, when at any time the discharge by stool is more liquid and frequently repeated than it ought to be: a very complicated and frequent disorder; being sometimes a primary disease, more frequently the effect of others; on some occasions it is a salutary effort of nature, which the practitioner ought to imitate, and often induce by art. To some persons, especially children, such looseness is common; and these, indeed, suffer much from costiveness.

663. It proceeds from various causes: particularly from some acrid substance received into the body, or generated in the intestines; from corruption, either acid or putrid, of the alimentary mass; from superabundance or acrimony of the bile; from blood or pus effused into the intestines, or from these being eroded or deprived of their proper mucus; from humours repelled from the surface of the body, and determined to the internal parts by cold, especially of the feet; or from a general corruption of the system, as in phthisis, hectic, or putrid fever, or scurvy, especially toward the termination of those diseases. In fevers, diarrhoea sometimes proves salutary, and either carries off the disease entirely, or renders it milder; but more frequently it has no good effect, but originating in putrescency, rather exhausts the strength of the patient, unless medicines be seasonably administered to correct that putrid tendency, or evacuants applied to relieve the stomach and bowels

from the mass of corrupted matter with which, in such diseases, they are commonly loaded. In some, the intestines are so weak and irritable (363.), that from the slightest cause, as catching cold, or any unusual commotion of mind, they are afflicted with severe diarrhoea. Lastly, whatever be the first origin of the disorder, if it continue long, it renders the bowels so feeble and irritable, that the disease, like many others (386.), though often removed, returns on the slightest occasions, even when no cause can be discerned.

664. Hence is laid open, the method of curing or relieving the disease,—by evacuants, by diluents, by gelatinous or gummy medicines, to correct the acidity, or putrescency, as occasion requires; by opium, by astringents; by warmer air, or clothing; or by sweat excited by artificial means.

665. The alvine flux is very hurtful, especially by impeding the nourishment of the system, being attended with indigestion; for the stomach is usually affected, and the mass of aliments passes so quickly through the viscera, that it can neither be digested, nor the nutritive part of it duly absorbed by the lacteals, that it may be received into the blood.

666. Besides, such a violent evacuation is noxious, the body being exhausted by the discharge, which deprives the blood of much nutritive matter; and in fact, not only is too large a portion of the mass of aliments ejected, but a great part of the intestinal fluids at the same time. And thus the whole body soon participates in the debility of the intestines.

667. Sometimes a severe and protracted diarrhœa, is aggravated to such a degree, that the aliments pass through the body with little or no change: this state of the disorder is called lientery. Sometimes, though seldom, from a similar cause, or from obstruction of the mesenteric glands, and other channels of conveyance to the blood, the chyle itself, like milk, is excluded with the faeces. This disorder is called the caeliac flux.

668. There is a disease to which the name dysentery is given, marked by violent gripes, and frequent desire

of going to stool, but the efforts are fruitless, commonly ejecting nothing except the mucus of the intestines, or a little blood; attended with great debility, and often putrescency and fever. It seems to proceed from a constriction, and some degree of inflammation of some part of the intestines, especially the inferior part, whence it happens, that in general nothing descends from these though they be greatly irritated. Nor is the disease readily cured, till the bowels have been well purged by suitable medicines.

669. Tenesmus is a frequent, insatiable, fruitless desire of going to stool, with violent effort, which is nevertheless attended with an extremely small excretion. Any irritation of the rectum or contiguous parts, certain acrid matters taken into the body, the more powerful medicines, particularly aloe, which is dissolved very slowly, and reaches the rectum little changed, severe and obstinate diarrhoea, dysentery, haemorrhoids, worms, fistula ani, calculus or ulcer in the bladder or urethra, &c. often induce tenesmus. It is frequently not a little injurious, partly by the severe restlessness it produces to the patient, partly by exhausting his strength by frequent and fruitless efforts, and because, by that straining, a prolapsus ani is induced, and the severe irritation communicated to the adjacent parts, the bladder, &c.

670. The motion of the intestines is often found inverted, so that they propel their contents from the inferior to the superior parts. Such an inversion, though more slight, takes place in eructation, when air extricated during imperfect digestion, rolls in the belly, rises to the stomach, or, beginning in the stomach, opens it's superior aperture, and by the inverted motion of that viscus, is expelled through the oesophagus and mouth.

671. But there is a more severe affection of that kind, which, by little and little, rejects not only air, but crude and corrupted aliments, or whatever is in the stomach. There are some to whom this affection is common. And some, with a slight effort, can imitate and induce this motion at pleasure, and thus ruminate like oxen.

672. In a similar manner, without uneasiness or severe effort, children easily and suddenly vomit the superfluous milk which they have sucked.

673. But very frequently the stomach being disordered, produces a very unpleasant feeling, which we call nausea. This is often attended with vertigo (267, 271.). When nausea becomes violent, not only is the motion of the stomach inverted, but also that of great part of the nearest intestine, and at length, the diaphragm, and abdominal muscles being hurried into motion, by the consent between them and the stomach, the whole abdomen, and especially the stomach, are squeezed as in a press, by which means, the contents are at length thrown out with great force by the oesophagus and mouth. Vomiting is commonly preceded by a great flow of the fluids of the mouth, and sometimes a tremor of the lower lip; and attended with a full and strong expiration, by which the larynx and trachea are guarded, that nothing enter them.

674. Nausea and vomiting are very frequent complaints, and proceed from almost innumerable causes, affecting either the stomach itself, or those very remote parts of the body, the irritations and affections of which, of every description, operate powerfully on the stomach, according to the laws of sympathy.

675. The following, therefore, often induce nausea and vomiting. All irritation of the stomach, or it's distention, as by a load of crude aliment, indigestion, obstruction about it's lower aperture, all acrid substances taken into it; diseases of the liver, intestines, kidneys, uterus, head, feet, the whole skin, and indeed of the whole body,—such as inflammation, calculus, jaundice, scirrhus, apoplexy, compression, fracture of the skull, vertigo, syncope, intense pain, gout, especially when retrocedent, fevers, mental affections, and disgusting ideas and descriptions.

676. It is easy, therefore, to account for the frequency of the disorder, and why it is often a primary disease, but more frequently the effect of other diseases; why it is in many cases a salutary effort of nature, to

be promoted by the practitioner to the utmost of his power; but at other times utterly useless and improper, and of course requiring to be suppressed as soon as possible,—as in fevers, where on some occasions it carries off the disease, but more frequently is an effect and part of it, rendering it more intense, or, at least, greatly impairing the strength of the patient.

677. Vomiting or nausea is likewise beneficial on many occasions, not only to the stomach, which it relieves from a heavy load, but to other parts also, or even to the whole body. It greatly promotes expectoration, when the lungs are oppressed either with their own mucus, or with blood, serum, pus, or water; it also promotes sweat, and the free distribution of the blood to the surface of the body, partly, perhaps, by the violent straining which attends vomiting, but apparently still more, from the astonishing consent which exists between the skin and the stomach. Hence in many diseases vomiting is a most excellent remedy.

678. Sometimes it proves injurious, if it be either too violent or too frequent, partly by producing debility and too great irritability in the stomach, so that it cannot bear violent and irregular motion with impunity; partly by the violent effort which fatigues the patient, and induces prolapsus, hernia, abortion, or haemorrhage, either from the stomach itself, from the lungs, or head, by means of prolonged and powerful expiration: this however very seldom happens. Farther, vomiting, when protracted, frequent, and violent, like diarrhœa, debilitates the whole body, exhausts it, and depraves the secretion of the gastric juice; whence proceeds indigestion, with all it's bad consequences.

679. Sometimes the motion of all the intestines, from the anus to the mouth, is found inverted: a disorder of very bad prognosis, to which the name ileus is usually given. In the greater number of cases it proceeds from some obstruction to the descent of the mass of aliments, or of the faeces; from spasm, scirrhus, inflammation of the intestines, or from costiveness, inducing colic, of which ileus is a part and effect. Some-

times, however, a most complete ileus is observed, when there is no obstruction in the intestines; and thus lotions injected by the anus have been sometimes thrown out by the mouth, and the patients have nevertheless recovered, after many days of such disease.

680. Ileus begins for the most part with tormina, nausea, vomiting, frequent eructation,—the air ascending first; afterward the patient belches forth a great deal of dark coloured, black, bilious, or corrupted matter; at length he vomits completely, with frequent and great straining, and violent pain of the bowels: at the same time, the belly is obstinately costive, and transmits no faeces; and the stomach agitated with a restless nausea and vomiting, commonly retains nothing. The strength of the patient is greatly and suddenly wasted, and he is brought into the greatest danger; for the disease in a short time induces inflammation, and consequent gangrene.

681. A more slight affection of this kind, namely, the inverted motion of the upper part of the intestine, takes place from all violent and prolonged vomiting, as in a person who is sea-sick, or who has taken too powerful an emetic; for a great quantity of bile often ascends this way from the intestine to the stomach, and is at length vomited by the mouth.

682. A violent vomiting and purging at the same time, is called cholera. It proceeds from a powerful irritation of the intestinal tube, when there is no obstruction in it; generally from excessive quantity or acrimony of the bile; whence it has it's name: though a similar affection may also proceed from other acrid substances, as from too strong a medicine, or ripe fruits taken too largely. The disease is often very violent, and greatly weakens the patient; in some cases cutting him off in a short time, unless suitable remedies are applied.

CHAP. XX.

Of secretion and excretion; their varieties and disorders.

683. From the mass of blood, such as it is in the aorta, and distributed from that over all the body, are secreted numerous fluids, differing from the blood and from one another (8.). Some of these serve various purposes in the system: some being superfluous or noxious, are constantly expelled from it: and others are necessary to the propagation of the species, and the nourishment of the new animal when first it sees the light.

684. To the first class belong the saliva, and other fluids of the mouth; the juices of the stomach, the intestines, and pancreas; the bile; that internal exhalation which bedews and moistens the cavities of the body, whether great or small; fat, the sebaceous ointment of the skin, the mucus of the passages of air, food, or urine; the tears; the aqueous humour of the eyes, and the cerumen or wax of the ears.

685. To the second class pertain the exhalation from the lungs, though indeed this is derived rather from the pulmonary artery than from the aorta, insensible perspiration, sweat, and urine.

686. And lastly, to the third class belong the male semen, the milky liquor of the prostate gland, the liquor of the bullae or ova found in the female ovary, perhaps the liquor amnii, or whatever other fluid is contributed by the female to generation, and the milk of the breasts, which, at a certain period after delivery, is very copiously secreted.

687. The secreted fluids are often divided and re-

duced by authors to certain classes, according to their qualities.

688. The watery fluids are the vapour of the lungs and of the skin, urine, saliva, pancreatic juice, tears, and the aqueous humour of the eye. The mucous fluids are tenacious or gummy, which besmear the passages of air, food, or urine, and defend them from every thing acrid. To these are likewise added the milky humour of the prostate gland and the semen. Gelatinous fluids are those which bedew the various cavities of the body, the liquor amnii, and possibly that of the ova which are found in the female ovary. Oleaginous fluids are, beside fat and the marrow of the bones, sebum or the ointment of the skin, bile, and ear-wax, which contain much oil, and, being well dried, burn readily, and with a vehement flame.

689. Farther, these humours are often mixed, and not easily obtained pure. The mouth is moistened by saliva and mucus at the same time; the nostrils by mucus and tears; sweat consists of the aqueous vapour and ointment of the skin, together with fat; and the juice of the stomach, intestines, joints, and all the cavities, consists of oil, mucus, coagulable lymph, and water. In milk, when first secreted, there is much water, oil, mucus, and coagulable lymph, as very well known experiments prove. Oleaginous fluids, when first formed, contain a considerable portion of water.

690. Again, other species of animals have many fluids, of which the greater number are similar to ours, as white of egg or albumen in all oviparous animals; others widely differ, as the acid fluid of insects, the poisons of bees or serpents, and the inky fluid of the cuttle-fish.

691. Some of the secreted fluids are found almost perfect in the blood itself, so that the simplest form of secretion or separation is nearly all that is requisite for producing them pure and unmixed; such are the exhalations from the lungs and skin, saliva, pancreatic juice, aqueous humour of the eye, urine, the exhalation which moistens all the cavities, as they consist either

of pure water, or of water with a small portion of coagulable lymph or salt, such as are in the blood.

692. But others of the fluids are of a nature entirely different, similar neither to the blood itself, nor to any of its constituent parts (492, 499.) ; such are fat, marrow, sebaceous ointment of the skin, bile, ear-wax, mucus, and the semen, a wonderful fluid, abounding with numerous animalcules.

693. There are, in fine, some others which consist partly of such elements as are found in the blood, and partly of others which cannot be detected in it, such as milk, the gelatinous part of which, on the addition of a runnet, coagulates and forms cheese, and has many things in common with the serum of the blood, (498.) when the latter is much diluted with water ; but nothing is shewn to be in the blood similar to the oleaginous part and sugar of milk, which affords butter and whey.

694. Again, every fluid, after being secreted, is liable, either in the natural course or from disease, to be again reabsorbed, and to return into the blood, which it corrupts in some degree, and then is perhaps secreted again by different organs, or at least passes through them.

695. In this manner the semen of many animals infects the whole body with it's foetor ; and bile, obstructed in the jaundice, returns into the blood, gives the skin a yellow tinge, and passes with the urine out of the system ; and the urine, when obstructed and reabsorbed into the blood, inundates the whole body, and is sometimes effused in the brain itself.

696. But no examples have yet been produced of any secreted humour being formed in any other than its appropriate organ : for that of a fluid already formed, taken up again into the mass of blood, and conveyed with it to foreign organs, is a quite different case.

697. No account or explication of secretion has been hitherto given ; the structure of the secreting organs is not as yet sufficiently known ; and there is no great probability, in the multiplied conjectures which

medical men, whether of the mathematical or chemical school, have advanced concerning their office and action.

698. A secreting organ seems to be formed of blood-vessels, both arteries and veins, opening into a cavity, or having continuous ducts, which convey the secreted fluid to it's destination. Such an organ, formed into a certain figure with cellular substance, and covered with a firmer membrane of the same, is called a gland: such are the liver, the kidneys, the testes, the prostate, the mammæ, the tonsils, the parotides, and other organs which secrete the fluids of the mouth, the cryptae or follicles, which contain mucus or a lubricating fluid, &c. The spleen too, and the brain itself, on account of the similitude of their structure, are usually classed with the glands or secreting organs, whether justly or otherwise is not yet agreed: nor indeed is it more evident whether the conglobate glands of the absorbents (440, 441.), should or should not be classed with these organs also.

699. The supply of blood sent to most of the glands is large compared with the bulk of the organ itself: also the arteries of the secreting organs, and the vena portarum, which in general is to be accounted an artery, are much stronger than the other arteries of the body. But the corresponding veins which, after secretion, return the blood to the heart, are found uncommonly large, thin, and feeble.

700. Some medical men have supposed that such a structure is given to the most part of the glands, chiefly with this intention, that the greatest possible quantity of blood might be subjected to their action, in order to a more copious secretion of the fluids; that the arteries, possessing uncommon force, might the better press out the thin parts of the mass of blood, as the secreted humour required to have more or less consistence; and that the power of the arteries might be the greatest, and the resistance of the veins the least possible, in order that the secretion might be effected with the greater ease, and the remaining blood returned more

quickly to the veins. But little confidence can be placed in these and similar conjectures.

701. For in certain secreting organs, such as the liver and the testes, the motion of the blood is very slow: in the former, the secretion is made from the blood of veins, but in the latter, the slender arteries, running a long course, giving out many branches, and being somewhat dilated, and making many convolutions, convey a languid stream of blood to the testes. Nor is it probable that this is done without intention, especially as a similar structure is found in almost all animals.

702. Again, some secretions, and copious ones too, are effected without glands: at least no glands subservient to them have hitherto been discovered; for instance, the exhalation of the lungs and of the skin, sweat, fat, and the gelatinous fluid which moistens the various cavities of the body, are secreted without glands. These humours, therefore, seem to make their escape from the blood by minute arteries, opening either into the cavities of the body, the lungs, or the skin, and perhaps are changed or entirely formed by a power not yet sufficiently ascertained. For fat unmixed is with difficulty if at all discerned in the blood: and that very subtile and well dissolved salt, which is present in the blood in a large proportion, is never mingled in a healthy body with the fat, with the gelatinous exhalations of the cavities of the body, with sweat, or the watery exhalation from the skin.

703. Neither is it more clearly understood how the blood is reduced in true glands, or changed and converted into other fluids; or how these are secreted, and flow from it unmixed.

704. The mathematical physicians have fancied that the blood conveyed to certain organs differs in its properties, and in the magnitude, figure, and density of the particles; corresponding to these, they suppose also various densities, attractions, apertures, and figures of the organs and arteries; as also that the organs themselves, like strainers which we use for purifying many

fluids, or separating them from each other, are imbued with a peculiar humour, so that they attract certain substances already existing in the blood, and either detain them or transmit them successively to other organs. But such conjectures rest on a slippery foundation, if on any foundation at all; for, except in the case of the liver, which is supplied with venous blood, there is no evidence of any difference existing between the blood of different organs; and as little evidence either that the particles of the various fluids exist in the blood, previous to it's being subjected to the action of the secreting organs, or for the various figures of particles or apertures of vessels. But, granting that their suppositions were well founded, no one of the fluids could have been secreted in any degree of purity: because the thinner, the particles of which, according to the notions of those who defend these opinions, making their escape along with the grosser, would adulterate them; and thus urine, for instance, being secreted along with bile, semen, mucus, milk or fat, would corrupt all those fluids. Farther, those which appear to be the densest, bile, ear-wax, and mucus, are secreted of a much thinner consistence: but their thinner and aqueous parts being taken up by the absorbent vessels, they in this way at last attain their due consistency. Even bile, already secreted and thickened, being again taken up into the blood, is very easily carried off from the body along with the urine, one of the thinnest of the fluids.

705. Neither have the chemists gained much, who have taken a quite different course, in order to explain this fact. Some were of opinion that the blood, being conveyed to the secreting organs, undergoes there some chemical change, which converts it into another substance, in the same way as must is changed into wine, and this again into vinegar; and that this might be the more completely and certainly effected, they supposed some ferment to be naturally inherent in the several glands, of such a nature as should induce a certain and definite change of the humour with which it

should be mixed. But nothing of that kind seems to be in the glands, nor, if it were found, would it explain the difficulty.

706. It is very certain that the far greater portion of the fluids undergoes a great and astonishing change of composition in the secreting organs. But whether it be proper to refer this to the effect of a ferment, let those persons judge who know the nature, the powers, and various kinds of ferments, and understand that change which those fluids undergo,—for it is to no purpose to dispute about the name. But we must carefully bear in mind, that the foresaid change depends much on the action of the vessels of the secreting organ; and, according as these are affected, the secreted humour varies much in quantity, and it's qualities are sometimes so depraved, that it seems to be almost converted into another substance. Further, by secretion the semen is produced, an admirable fluid, full of animalcules, a fact for which neither mathematicians nor chemists can readily account. Nor, in fact, is there room to doubt that, this secretion, like the other functions of the body, depends in some measure on the vital principle, and on those powers, which, though little understood, are peculiar to the living system, and of course incapable of being explained solely on mechanical or chemical principles.

707. But though it is not in our power to explain the primary change which takes place in secretion, numerous facts relative to this function, and not unworthy of the attention of practitioners, have been ascertained.

708. Many fluids, immediately on being secreted, are either ejected from the body, or expended on their appropriate objects within it. But others pass by excretory or carrying ducts from their glands into suitable receptacles, in which they frequently remain long, and are the subjects of farther change. For a great deal of the fluid is taken up by the absorbents; what remains is inspissated, becomes more stimulating, and is thereby more fitted for it's functions. Besides, in this way the

requisite quantity of the secreted humour is collected to be either ejected in due time, or applied to it's proper use within the system. The urinary and gall bladders, the mucous follicles in every part of the body, and, in the opinion of the greater part of physicians, the vesicae seminales, are instances of the contrivance mentioned.

709. The increased impetus of the whole blood has little effect in increasing particular secretions, except insensible perspiration and sweat: but these are increased in a surprising degree, provided there be no contraction or other obstruction of the extreme vessels of the skin, or cold applied to the body. This is evident from the well known effects of exercise, heat, fevers, and of many stimulating medicines.

710. Every secretion, however, is increased by the increased vascular action of it's appropriate organ, provided that be not in excess, or otherwise very diseased. In this manner many secretions are promoted by every stimulus applied to their organs, or received into the mass of blood, and affecting some parts more than others. This is proved by any acrid substance received into the eye, or salt into the mouth, by mercury also, and many stimulants, especially diuretics, any way received into the blood.

711. Farther, a stimulus which might seem to be general, and which affects the whole body, or even the mind too, according to the laws of sympathy (361.), frequently increases some of the secretions and diminishes others. In grief, tears,—and in anger, bile,—are secreted in unusual abundance: in either passion the fauces often become parched. The saliva of a hungry person flows at the sight or contemplation of agreeable food; and, in like manner, in the males of many species of animals, the semen is secreted in greater abundance on seeing or smelling a female in season: and in men it is often increased by contemplating the picture of the beloved object, or even from the recollection of venery.

712. Spasm, contraction, or any irregular action

whatever of the vessels of the secreting organ, in some cases obstructs, and in others increases secretion, and sometimes entirely depraves it; also spasm of remote parts, by driving the blood from it's usual course, and directing it into new channels (384, 486.), frequently increases secretions. This is proved by the various and surprising affections of urine and milk, occasioned by hysteria, by terror, by anger, or by cold.

713. Certain secretions are often increased, perhaps sometimes induced by a stimulus, however slight, whether mechanical or chemical, applied to the excretory ducts. The very action of mastication and taste of food, especially of the more sapid kind, promote the flow of saliva; a strong medicine moves the bile; and the child, by sucking, not only draws milk from the breast, but promotes it's secretion, and, it would seem in some cases, provokes it to come where there was none previously found.

714. The greatest number of the secretions are unremitting and necessary to life and health. There are some, however, particnlarly such as are subservient to generation, or to the nourishment of the new born infant, which commence and terminate at a certain fixed period, and are induced by a particular stimulus. The male semen and the genital fluid of females, if any such there be, are scarcely secreted till the age of puberty; and neither do elderly women, nor men worn out with age, generally possess genital power. Milk too, is seldom secreted but after delivery, which is to be ascribed to the surprising consent between the uterus and the breasts.

715. There is a wonderful equilibrium found between various secretions, so that as the one is increased the other is diminished in nearly the same proportion; by this means the system is secured against being so easily and suddenly exhausted (523.), as otherwise it might have been. This is chiefly discernible between the sweat and insensible perspiration, on the one hand, and, on the other, the excretions by urine and stool,

though the same thing is often observed in other secretions.

716. Particular persons have some secretions more copious or sparing, more bland or more stimulating than usual: and, in general the more sparing, they become the more acrid. In children all the fluids are bland and copious when compared with those of a grown person. In women too they are commonly somewhat more mild than in men. Such varieties are often observed in saliva, sweat, urine, bile, and semen. Some persons have the mouth always moist, and feel no thirst. One person sweats profusely and almost without interruption: the skin of another is arid. Some suffer much from a superabundant or too acrid bile. The urine of some persons is more limpid and bland: of others red and sharp. The semen itself smells much stronger in some than in others.

717. In this matter, though much depend on the original structure of the body, and the varieties which age produces, much also depends on the mode of living, and the food to which persons are accustomed.

718. The general state of the mass of blood has a considerable influence on the fluids, which are derived from it. After eating and drinking, certain of these are secreted more copiously, especially milk, urine, insensible perspiration, and sweat. Milk, a most copious fluid in a nurse, is, after abstinence of some hours, either not secreted at all, or in small quantity and so acrid, that the child would reject it, and in fact, could not suck it with impunity. But in a very short space after taking food, the same flows copious, bland, and nutritive. The urine, too, almost immediately after drinking largely, especially of cool liquid, is abundantly secreted; and sometimes so speedily, that it is scarcely credible that the drink itself could have reached the kidneys. It is probable that some stimulus is communicated to the kidneys, by means of the consent which they have with the stomach, and perhaps some spasm induced in the more remote vessels, such as directs more blood to the kidneys (476.), and excites intense action in them. Nor can any person sweat long and profuse-

ly, unless he either possess a very moist constitution, and have much thin fluid in his veins, or, during his sweating abundantly, dilute the humours, and fill the body by drinking freely. Farther, by the same use of dilution, we may excite either urine or sweat, according as the body is kept cool or warm.

719. Lastly, during sleep, the greater part, if not the whole of the secretions, are diminished, because the circulation goes on more moderately, and the secreting organs, and in general the whole body, are less sensible, and therefore with greater difficulty and more slowly excited to their usual offices. But if sweat seem to be increased during sleep, this is doubtless to be attributed to the warmer clothing with which we are then covered; for we will be far enough from sweating or getting warm, if we sleep covered with those clothes only which we use when awake.

720. Some secretions are copious, others very sparing: but the quantity of them cannot be reduced to definite measures, for the reasons mentioned (716, 719.), since it varies much in the healthy system, much more in a diseased one. In numerous instances, there is a great and almost incredible quantity of saliva, of gastric juice, or of bile, secreted in a short time.

721. Nor is a judgment easily formed of the quantity of the excretions, of the urine or sweat, of the exhalation of the skin or of the lungs, though numerous experiments have been instituted to investigate this subject, being one which medical men supposed not difficult to examine, and of great utility, both for the preservation of health, and the cure of disease.

722. The urine indeed is easily weighed, but it varies exceedingly, according to the constitution, age, or mode of life, or the diet which we use; and most of all according as the perspiration is more abundant or sparing, whether from exercise or indolence, or from heat or cold applied to the body. For there is found a wonderful equilibrium between these two excretions. Sometimes even in a healthy person, the daily discharge of urine will amount scarcely to one pound, sometimes to

four or five; in disease, however, it is often twelve or more; but the mean quantity which a person in health evacuates in a day, is from three to three and a half pounds.

723. The insensible perspiration and the sweat vary in a similar way with the urine, but the exact quantity of them is not so easily detected, since the application of the balance to the body, only shews the excess of the perspired fluid, above what is taken in during the same time. Nor are there wanting very decisive experiments, which prove, that the body frequently, if not always, absorbs somewhat from the atmosphere. This indeed detracts a good deal from the authority of the Sanctorian observations; for by this means, the body on some occasions attracts as much from the atmosphere as equals, or even far exceeds, the quantity perspired, which is especially discernible, when one has been exhausted with severe labour, want of food, a great discharge of urine, or when relaxing into dropsy after the water has been taken off by an operation.

724. Every secretion, either more abundant or more sparing than the due measure, is noxious (62.); because the function to which it is subservient, is impeded, or at least in some degree depraved. Thus the senses of smelling and taste, together with the digestion of food, are often disordered by the excess or deficiency of the fluids of the nostrils, the mouth, the stomach, the intestines, or the liver. It is also attended with considerable injury, when a fluid is excerned contrary to the intention of nature: as in the case of the saliva, which many, with great injury to themselves, often excite in a preternatural manner, by the use of a variety of acrid medicines, and then must spit it out: thus the body is exhausted by an evacuation entirely against nature, and the digestion of food is effected with difficulty, from the defect of saliva which should promote it.

725. Again, if those fluids intended by nature for excretion, especially urine and perspiration, are either suppressed or retained, or voided in too great quantity,

the health is quickly injured, and in a still greater degree (62).

726. Excessive perspiration is owing chiefly to increased impetus of the blood (467, 8.), which, having little effect on the other excretions, affects this very much (709.); to the texture of the skin being unbraced; it's vessels and pores being relaxed and opened by heat, the warm bath, or a constitution lax and flaccid; or to the blood being too much diluted with moisture, which it easily parts with and exhales (525, 527.). Hence a reason may be assigned why certain parts sweat while others are dry, or of that kind of cold sweat, which is often observed when the powers which maintain the circulation are failing; a very unfavourable sign.

727. Excessive cutaneous excretion is noxious chiefly on this account, that it exhausts, debilitates, and unbraces the system, relaxes the skin, and renders it feeble and uncommonly sensible, obnoxious to all the bad consequences of cold. But excessive sweating, by suddenly exhausting and unbracing the body, may even induce syncope or death itself. It were not easy, however, to adduce instances of the blood being in this manner inspissated, and corrupted, and of persons becoming of course prone to inflammations, fevers, &c.

728. To some persons, profuse sweat is common, and not to be accounted a disease, and in many cases cannot be repressed without great and instant danger. A copious sweat also proves critical in many diseases, especially fevers; but of many it is but a symptom or constituent part, as it neither proves a crisis of the disease, nor any way salutary, but exhausting the strength, is rather hurtful to the patient. Experience alone in the individual cases of disease, shews whether sweat be beneficial or otherwise. Nevertheless it deserves attention, that sweat is for the most part beneficial, when it is general, extends freely over the feet, is thin, warm, and constant, abates the heat of the body, and the patient bears it well; when it is accompanied with a softer, fuller, and slower pulse, moist mouth and tongue, relieves

anxiety, allays universal uneasiness, and renovates the appetite. On the contrary, that sweat is pernicious which is tenacious and gelatinous, cold, offensive to the smell, affecting certain parts only, as the face, the neck, or the breast, while the remaining parts of the body, the limbs especially, are dry ; which greatly exhausts the patient, but does not alleviate disease : for such evacuation, if it prove not beneficial, for the most part does injury. In fine, practitioners learning from nature herself, in many diseases excite by artificial means a very profuse sweat, often with signal advantage to the patient ; which must be more fully treated of afterwards in it's own place.

729. Sweat and insensible perspiration, are not unfrequently observed to be diminished or suppressed. These excretions gradually become deficient through an indolent and sedentary mode of life, depressing passions (344, 346.) which greatly diminish the force of the circulation, general debility, a cold and moist climate or season, neglect of cleanliness, food too hard and difficult to exhale, and through the constriction or closing of numerous pores and smaller vessels of the skin, as in old people, whose perspiration is always more sparing, and urine more copious in proportion than that of younger people.

730. Many disorders proceed from such a deficiency. Unless the unusual retention be compensated by the increase of some other secretion, the whole body becomes full, dull, and languid, and the mind also listless and sorrowful ; for a cheerful and happy state of mind promotes the perspiration, and is in turn somehow affected by it. Digestion is also depraved, and the appetite lessened through the remarkable (357.) sympathy between the skin and the stomach. In fine, it is not improbable, that the matter which ought to have been excerned, being long retained, and becoming putrescent, or at any rate noxious, the whole mass of fluids will be gradually depraved.

731. But when sweat is suddenly checked, it quickly produces still more serious injury ; not only by the re-

tention of the perspirable matter, but because the humours flowing freely to the skin, are repelled from it, and determined to other parts by the strong contraction or spasm induced on it's minute vessels.—Hence frequently proceed fevers, inflammations, irregular congestions of blood, haemorrhage, and the increase or disorder of other excretions, chiefly urine and faeces.

732. Perspiration and sweat are often and suddenly checked: especially by cold applied to the body when very warm, or sometimes by depressing passions, and spasmodic diseases, such as hysteria. They are also suppressed by some contraction, as it would seem, of the minute vessels of the skin, induced by certain causes, such as produce fevers, both intermittent and continued, the cause of which is hitherto but little understood.

733. The urine also is often too abundant, or diminished, suppressed, or discharged with difficulty or pain; sometimes also much changed in it's qualities. The quantity of it is very great without being accounted a disease, when the blood is diluted with much thin fluid, infected with a great quantity of saline matters, and rendered more acrid; or when the humours, driven from the surface, are thrown on the internal parts. There is often a great discharge of urine, owing to some acrid substance infecting the blood, and irritating the kidneys themselves, as squill, meadow saffron, &c. On many occasions too, the urine flows limpid and very abundant, owing apparently to spasm of the emulgent arteries, whether by irritation arising in the kidneys themselves, by calculus, &c. or by consent with other parts, the intestines perhaps, or skin, as in hysteria. In fine, owing to some disorder, which, in many cases, is but imperfectly understood, affecting either the kidneys, or other parts, or even the whole system, there is sometimes observed an incredible discharge of urine, differing widely from it's healthy state, and containing much oil and sugar. This kind of disease is called Diabetes, the nature and causes of which are not yet fully comprehended. It is nevertheless probable, that beside

the disorders of the kidneys, spasm, relaxation, &c. there is in it some corruption of the whole mass of blood, perhaps owing to a depraved digestion, both in the stomach and lungs: because this fluid, however differing from it's usual and natural state, is derived from the blood, and is apparently not dissimilar to aliments not yet fully assimilated by proper digestion.

734. It will now, therefore, be abundantly evident, why an immoderate flow of urine is injurious, namely, because it wastes the strength, impedes nutrition, and exhausts the body. Nor is it indeed any way surprising, that some should have sunk under such a disease; or that an affection scarce understood, should with difficulty be cured, or often utterly incurable.

735. But a profuse discharge of urine, though not altogether unworthy of notice, is, for the most part, a fleeting complaint, and of very slight importance, common to those afflicted with hysteria and other diseases of the nervous system. It likewise deserves notice, that some diseases, fever in some instances, and dropsy of various kinds, are carried off by such a discharge. To this it was owing that physicians were formerly in the habit of attending to the state of the urine, particularly of feverish patients; and many laboured to give an account of it's varieties, and the various events which they were supposed to prognosticate. But practitioners in our times are far from placing so much confidence in symptoms of that kind as their predecessors did. There is, however, no doubt, that a knowledge of those varieties, may sometimes prove of very great utility to a discerning and skilful physician, who will not despise the most trifling circumstances.

736. Lastly, it is not only agreeable to reason, but approved by experience, that, in many diseases, it is of advantage to excite a more copious discharge of urine than ordinary, which will be explained in it's own place.

737. The urine is often suppressed with great inconvenience, and, indeed, with imminent danger to the patient, unless it's secretion, or excretion, be speedily re-

stored. This disorder, to which the name Ischuria is given, is by some distinguished into two, by others, into four. It is of little moment how many species of the disease they enumerate, provided they duly attend to the circumstance, that this complicated disease sometimes derives it's origin from various disorders of the kidneys, the ureters, the bladder, or urethra, and of the contiguous or co-operating parts. Thus, any irritation, or obstruction of one or both kidneys, or ureters, by calculus, sabulous matter, mucus, blood, inflammation, suppuration, schirrus, or spasm; by the swelling and compression of the contiguous parts, as in case of distention of the viscera and uterus, or even of the abdomen, by the foetus, or faeces, flatulency or water, all these either prevent the urine from being secreted, or cause the secretion to be more sparing than usual, and often much changed; or, in fine, after secretion, prevent it's passage to the bladder.

738. Again, after the urine has reached the bladder, it is not unfrequently retained there. This disease is owing to various disorders of this organ:—frequently to irritation, inflammation, or spasm, induced by calculus, acrid substances taken in, or by consent with the contiguous parts;—to injury done to the structure of the bladder itself, as in the case of hernia or laceration; —to debility or paralysis of it's fibres, as is observed in general paralysis, and sometimes, indeed, in it's excessive distention (324.) without paralysis of any other part;—to it's becoming callous, schirrous, or ulcerated; —to obstruction of it's neck by a great quantity of pus, blood, thick mucus, or calculus;—in fine, to not a few disorders of the urethra; as it's obstruction, constriction, or concretion, disorders that are sometimes observed without any known cause, but are often met with after venereal complaints unskilfully treated, especially after virulent gonorrhoea, which has been cured or suppressed by injections into the urethra of various medicines, particularly the astringent and acrid, and even where these were of a character sufficiently bland.

739. Lastly, in the case of a general stupor (143.

173.), when the brain is diseased (295.), as in certain fevers, the urine is detained in the bladder whenever the patient is incapacitated for perceiving the usual stimulus, or even a more violent one, or when the fibres of the bladder itself are not excited to contract; whence it is at length distended to that degree, that with difficulty, if at all, it can be again stimulated to due contraction. In fevers, and indeed in all diseases, this is a bad prognostic, sometimes a fatal one.

740. If the urine be long suppressed, whatever be the cause, it produces a great distention of the bladder, sometimes to a degree almost incredible, oppression, uneasiness, pain, not of it alone, but of the contiguous parts, and indeed of the whole system; perhaps spasm or invincible contraction of the sphincter, debility, or real paralysis (324, 81.) of the other fibres which empty it by their contraction, so that the urine does not flow, even when the catheter is introduced; inflammation, gangrene, or laceration of the bladder; at first severe irritation of the whole system, then nausea, vomiting, vertigo, general stupor, an inundation of the whole mass of blood with a urinous fluid (525, 26, 40.), which at last is effused into the various cavities of the trunk, and of the head, speedily inducing drowsiness, tremors, convulsions, and death.

741. From the same causes, but operating with less violence, namely, unusual irritation of every kind, inflammation, ulcer, callus, or calculus, of the bladder, it's mucus being abraded or morbid, and certain acrid medicines, or diseases of the neighbouring parts, the urine is passed with difficulty and pain; this disorder is named Dysuria. The urine is likewise frequently red, black, bloody, purulent, mucous, or sabulous: the reason of these things is plain.

742. A disorder very frequently attends the evacuation of urine, in which the patient is pressed with a troublesome, almost incessant, and insatiable desire to discharge it, though only a few small drops are passed, for the most part not without some degree of pain. This disease is named Strangury. Certain acrid substances

often induce this disorder in a person otherwise healthy. It is common to aged people, who often suffer various ways in the kidneys and bladder; it frequently proceeds from calculus irritating the bladder, or from the state of that organ itself, when inflamed, ulcerated, deprived of it's mucus, or when this last is corrupted by some peculiar disorders; or, in fine, from the diseases or peculiar state of the contiguous or consenting parts, as of the uterus, vagina, urethra, prostate gland, rectum, or kidneys, affected by inflammation, tenesmus, calculus, prolapsus, or pregnancy.

743. There is another affection of the urinary discharge, not rare, and bearing a near affinity to the last, in which the urine cannot be duly retained, till it be discharged in proper quantity, and in proper season, but is passed involuntarily or unconsciously, under no controul of volition, as is commonly the case in healthy persons, but merely by the action of it's organs: in some cases, while the patient is unconscious, it flows constantly, almost drop by drop; this, more strictly speaking, is denominated incontinency of urine. In other cases, however, it is retained some time, till the quantity being increased, it is, nevertheless, unvoluntarily or unconsciously discharged.

744. Incontinency of urine is frequently induced by debility, palsy, ulcer, a wound, severe and protracted irritation of the bladder, especially of it's sphincter muscle, owing to calculus, general palsy, or a difficult parturition, straining or injuring the neighbouring parts. A similar disorder is observed in numerous diseases, especially fevers and hydrocephalus, where there is so much drowsiness, that the patient does not perceive the propensity, though the bladder itself, and the muscles of respiration sympathising with it, obey the usual stimulus. For a similar reason, many children cannot duly retain their urine, especially during sleep, though in other respects in perfect health: their secretions being more copious, their slumbers deeper, not easily interrupted, greater irritability in all the muscular fibres, and therefore the bladder being more impatient of enlargement

than in the case of adults. On some occasions, the urine is retained with difficulty, on account of tumours of the contiguous parts compressing the bladder, as in the case of pregnancy. Sometimes it is preternaturally ejected with the greatest violence, either by general spasms, or such violent contractions of the muscles of respiration as powerfully compress the whole abdomen, as in coughing, sneezing, laughter, parturition, &c.

745. In fine, among disorders of the urinary organs, must be enumerated the formation of calculi, which produce so many and so great diseases (63.). Beside water and salts, urine contains no small portion of earth, and of the coagulable part of the blood, already in some degree depraved, and disposed to still farther depravation.

746. Hence it happens that the urine, even of one in perfect health, while it is cooling, deposites a copious sediment, such as soon incrusts the vessel. In health, the urine deposites no such sediment within the body, but if the smallest portion of any solid matter be introduced into the bladder, and left there, it is quickly covered with such a crust, and increases gradually to a great size. It is probable that some disorders of the fluids, perhaps little understood, are sometimes present, and increase the tendency to the formation of calculi. For it is quite evident, not only that the disease is often found congenital and hereditary, but that persons afflicted with calculi are very often subject to diseases of the stomach, especially acidity; and that many of them have been much relieved by various medicines suited to prevent acidity in the stomach and intestines, or to correct it when already existing in them. Farther, the opinion has prevailed, both formerly and of late, that one kind of food, and of drink particularly, such as acid wines, cyder, &c. dispose persons to calculi, and that a different kind preserves them nearly safe from such a disease. Though all these opinions are but somewhat uncertain, yet it cannot be denied, that the urine of some persons is very different from that of others, as to the quantity of sabulous matter; and that in some cases, it either contains more of the matter of concretion,

more readily parts with what it contains, or is itself more readily converted into such matter.

747. Besides, from various causes, in some persons more than in others, such nuclei will be formed in the urinary passages, as become the foundation of calculi. Thus, the very mucus of the kidneys, either being, through inflammation, or other organic disorders, secreted of a diseased quality, or, after it's secretion, being inspissated or congealed into a grosser mass; blood, coagulable lymph, or pus, escaping from their vessels by relaxation or inflammation; or the most minute concretions formed in the kidney, will serve the purpose of nuclei.

748. But such concretions, however small at first, increase every day, for the reasons already mentioned (746.). They often descend spontaneously from the kidneys, without much pain or inconvenience, and do not stop in the bladder, but are speedily discharged with the urine. But more frequently they remain in the kidneys, till they have increased to such a size, as cannot, with ease, descend by the ureter. Sometimes they remain long in the kidneys, with little injury, never suspected, till descending the ureter, they irritate and obstruct it, affect the one kidney or the other also by sympathy, and agitate the whole body. Hence arises a vast and direful train of diseases; frequently agonizing pain of the ureter, of the kidneys, and contiguous parts; nausea, vomiting, indigestion, contraction of the ureter, which is furnished with moving fibres, obstruction of urine; severe irritation, often inflammation, sometimes suppuration of the kidney; strangury, dysuria, ischuria, urine sometimes limpid, often mucous, as it were bloody, purulent, or black; sometimes also violent fever; in some cases a tabes renalis, in others a surprising corruption, obstruction, tumour, emaciation, or even destruction of the kidney, so that on opening the body after death, the one has appeared, in some instances, to be wanting. Often, also, while the calculus sticks in the ureter, or descends along it with great difficulty, the pain is propagated to the testicle or leg of

the same side: but more frequently the patient complains of a stupor of the leg, and a feeling as if the testicles were drawn up. This seems to originate from compression of the spermatic cord, lying immediately under the ureter, or at least from some small branches, perhaps extremely minute ones, of nerves proceeding from the psoas muscle; or from the testicle or leg being irritated or pressed, either by the ureter itself, when exceedingly distended, or by that muscle, swelled or inflamed, in consequence of it's vicinity to the diseased part, and sympathy (362.) with it. These symptoms too, though in fact of slight importance in themselves, prove just objects of the practitioner's attention, in as much as for the most part, they clearly point out the nature of a disease, the other symptoms of which are sometimes rather equivocal.

749. The cause of so many disorders is sufficiently evident: so is the principle on which the calculus gradually descends, propelled by the urine, and in the distended and relaxed passage: nor is there any doubt of the indications of cure, which are to mitigate the most urgent symptoms, or facilitate the descent of the calculus, by such remedies as remove or moderate inflammation and fever, abate sensibility, take away irritation, relax the contraction of the passage, unbrace the whole system, empty the intestines, repress vomiting, wash the urinary passages, dilute the urine itself, foment the irritated and pained organs, and cover them with a gummy and gelatinous fluid, which may supply the place of the natural mucus abraded by the violence of the disease.

750. In this manner we guard against the instant danger: but little is gained if the calculus stop in the bladder, because, by a gradual increase in bulk, it is soon of a size too large for being passed, and induces severe irritation, then pain of the bladder, still more of the orifice of the urethra, strangury, dysuria, ischuria, incontinency of urine, inflammation, suppuration, ulcer, gangrene, or callosity of the bladder; and at length, (if the wretched patient do not sink ere he reach this

stage), having exhausted the strength, induces, by incessant pain and irritation, a slow, hectic fever, emaciation, and wasting, slowly perhaps, but certainly fatal.

751. Lastly, it must not be passed in silence, that those organs of secretion which are more strictly denominated glands, are, beyond all other parts of the body, obnoxious to obstruction, and a number of terrible disorders, the consequences of it.

752. Hence often arises a large tumour of surprising hardness, not only without pain, but often with diminished sensibility of the affected part: this disease is denominated Schirrus. It sometimes continues long without pain, or indeed any uneasiness; but sooner or later it is attended with pain, and that of the most acute description; it gradually advances to a slow and malignant suppuration, and at last becomes a horrible ulcer, not only consuming, in the first place, the affected part, but devouring all in the vicinity, and infecting the whole system with the most virulent and incurable poison. This is denominated Carcinoma or cancer, proving, on some occasions, suddenly fatal, by the erosion of some large artery or vein, but for the most part inducing a slow and deplorable consumption, with hectic fever, inevitably fatal.

753. The cause of this horrible disease is hitherto obscure. It seems probable, however, that the structure of the glands renders the motion of the blood in them unusually slow, which gives greater facilities to obstruction, and renders suppuration imperfect and malignant. Farther, an idiosyncrasy, in many cases, congenital and hereditary, renders many obnoxious to this disease, when the constitution is feeble, languid, and torpid. It has been observed also, that scrofulous persons are more liable than others to this disease. It is more frequent in advanced life, than in the earlier periods, among those who have been debilitated by indolence, or exhausted by excessive and incessant labour; among those who support life with food of bad quality, little nourishment, and difficult to digest; and, in fine, among those in whom depressing and protracted men-

tal uneasiness has greatly impaired all the powers, particularly those of the circulating system.

754. A schirrus often begins without any known external cause; in some cases it succeeds an imperfect resolution of inflammation; more frequently it proceeds from some external violence affecting a part full of glands: nor is it difficult to account for these things producing such an effect, because they injure the fabric of the gland, and often produce obstruction in it. When all these considerations are duly weighed, it will no longer surprise any one, that a disease which, even in it's commencement, is difficult of cure, should, after becoming inveterate, be at length utterly incurable.

CHAP. XXI.

Of the power of generation in each sex, it's various morbid affections, and those of the organs.

755. INDIVIDUALS, in the lapse of years, decay, and die; provision has therefore been made against the extinction of the whole species, by that admirable faculty which man enjoys, in common with every animal, of generating from himself an offspring in his own resemblance (12, 13.).

756. Although no individual has hitherto thoroughly investigated this deepest arcanum of nature; and though possibly no mortal will ever reach a complete examination and explanation of a subject so obscure, yet it is deserving the attention of every medical man to acquire the knowledge of the particular facts relating to it, however scanty or imperfect, which reason dictates, or observation hath established: especially as the function, in itself of no trifling moment, is not only liable to it's peculiar disorders, but likewise the state of the parts subservient to it, greatly affects the whole body, and often either induces various diseases (52.), or carries off those already formed.

757. In early life there is no genital power: but, at a certain period, generally about the fourteenth year, when the system has attained greater firmness, and some parts, apparently approximating to their just shape and magnitude, direct the blood into other channels; the male organs of generation, previously without use, small, and growing slowly, or only in proportion to the rest of the body, are suddenly changed, grow, are evolved, and adapted to their proper functions. Then hair makes it's appearance on the pubes, and a prolific semen is secret-

ed, by the stimulus of which, the youth is excited to venery.

758. This stimulus, aided and increased by many circumstances, particularly such as inflame the imagination, according to the laws of sympathy, increases the current of the blood toward the genital system ; in consequence of which, the influx of it by the arteries, becoming at length more abundant than the reflux by the veins (422.), the penis becomes tumid and rigid, and the glans becoming turgid by the abundance of blood, acquires a very acute sense (143, 170.), so that the slightest tickling of it, such as takes place in venery, affords the most intense feeling of pleasure, and agitates, in an astonishing manner, the whole nervous system, and especially excites the neighbouring muscles, called levatores ani, to contract ; by the compression of which, the vesiculae seminales, and ductus deferentes, are squeezed and emptied. It is also probable, that the semen is, at the same time, secreted more copiously in the testicles by means of the increased action of the vessels which form the greatest part of their substance ; from these it is poured into the urethra, and being there effused, either directly from the testicles, or from the vesiculae seminales, it gives a new stimulus, which is obeyed by the accelerator muscle, an organ of voluntary motion in passing urine, but involuntary in expelling the semen, by the powerful and repeated contraction of which, the prolific fluid is at length ejected with a force sufficient to propel it to it's destination, or, at least, into the uterus.

759. Nor is the accelerator muscle the only one excited to action : in venery, there is commonly observed a slight tremor or convulsion ; but sometimes a very violent convulsion of all the muscles. Hence are panting, palpitation, syncope, sometimes epilepsy, or, in short, sudden death, which has sometimes cut off persons when thus engaged, and dreading nothing of the kind.

760. After venery, the body always feels somewhat languid, in some instances, for a considerable time ; the

erection goes off, the afflux of the blood becoming more sparing, and the resumption by the veins more copious; desire is appeased, the irritation removed, the body is relaxed, and sleep steals on more easily.

761. In cold climates, man reaches puberty more slowly; more early in those that are warm. It is also slowly attained by boys accustomed to severe labour, and sparing or slender diet; and is precipitated in those who live more luxuriously. It is often accelerated in an improper manner by such discourses or thoughts as inflame the imagination, or by a base abuse of the organs before the proper time.

762. The genital organs are not the only parts affected by puberty; the whole system undergoes important, and often very salutary changes. The beard makes it's appearance, the voice becomes grave and more sonorous, the body acquires additional firmness and vigour, and frequently a great and sudden growth; and oftimes many diseases, owing either to excessive laxness of the solid parts, or to the mobility of the nervous system, as convulsions, struma, &c., disappear of their own accord. The mind too acquires new vigour, as well as the body, and shaking off his boyish habits, the youth acquires in a short time those of the manly age: but in eunuchs nothing of this kind takes place; the voice is not altered; no beard appears; the body remains feeble, and seldom attains the proper shape; and they are generally languid, and of an inconstant, soft, and effeminate mind. It is therefore beyond doubt, that those changes, and similar ones, or still greater which are observed in other animals, depend in some way on puberty or secretion of the semen, whatever be the mode in which it operates. It is of little moment whether the semen be long retained, or exhausted by proper use. But an excessive indulgence of this appetite is very hurtful, especially to the young, who by that means become degenerate both in mind and body; the reason of which can be no mystery to those who reflect on the great violence which venereal grati-

fication does to the whole body, particularly the nervous system.

763. In the flower of age, or in it's manly period, men are most vigorous for venereal gratification. In the first approaches of old age they are still adapted to it, but less keen. But in extreme age there is either no capacity for such congress, or it is sterile, oppressive, or intolerable and dangerous to the enfeebled and sapless body; because in old men every sense is blunted, the nervous energy is abated, the circulation more languid, the secretions commonly more sparing, especially that of semen: the muscles too which eject it are feeble, or almost paralytic, through the innumerable disorders of these organs, and of the neighbouring parts, to which old age is subject (715.). But in these things there is a great difference between individuals: for instances are reported of old men, who have been strenuously addicted to venery after they had completed a century; nor is it doubtful, or even a rare circumstance, for a man to become a father at fourscore.

764. In some cases men are destitute of the powers of generation, having no appetite, no erection, no emission, owing generally to unknown faults of the organs, as when the structure is naturally bad, or a defect of feeling or secretion. But such impotence more frequently proceeds from other diseases of the genital system, as the lues venerea, or the structure being injured by contusion or wound. It seems not seldom to proceed from excessive venery, especially from the solitary vice, which has no bounds.

765. It is likely that men are sometimes sterile from some fault of the semen, though there appear no disorders in the organs, and they feel sufficiently vigorous; and many instances shew that every man does not prove prolific with every woman, though each may be fruitful enough with others.

766. Sometimes an obstinate and painful erection takes place, either without appetite or with great and insatiable desire. To this rare kind of disorder, aro given the several names, tentigo, priapism, satyriasis.

It is owing commonly to severe irritation of the member itself, or of the neighbouring parts, particularly the bladder, either stimulated by acrid medicines, as cantharides, or distended with urine, acrid or in great quantity. To this is owing that slighter tentigo that is often felt on awaking, by persons otherwise in the best health, and not at all addicted to such gratifications: as also those erections which often take place in children or boys below puberty, though the structure of the organ is not evolved so far as to admit of a natural and manly erection.

767. Nearly at the same age at which boys attain puberty, girls usually become marriageable: the genital organs are evolved, and become adequate to their proper offices; the pubes is clothed, the breasts swell, the face acquires new beauty, and the whole shape an elegance before unknown. The health also, if formerly infirm, often becomes suddenly changed for the better, as in young persons of the other sex. But there is by no means so great a change of the whole body in females as in men: for the voice is not changed, no beard appears, nor does the body and mind acquire such an addition of strength and vigour: and now at last is displayed that difference of constitution between the sexes, which in infants scarcely existed, and in boys and girls was but obscure or indiscernible.

768. But the most important change takes place internally in the viscera of the girl, by which the uterus, formerly a useless organ, emits every month a small portion of blood, and becomes fitted for the conception, gestation, and nutrition of progeny, till in due time it is brought forth to the light.

769. There has been much discussion among medical men, by what means the menses are produced, and for what purpose the great Parent of all has imposed on women alone, a law apparently so unjust: for it is not yet ascertained, whether other species of animals are also subject to these evacuations; but if any are so, they are certainly very few, and those only which bear the greatest resemblance to mankind.

770. No wise person will attempt to assign a reason why such a structure as should produce a discharge of this description, is given to women, and to them only: nor is it the business of a physician to scrutinize arcana of that kind. It may suffice if he can explain what that structure is, and shew how the discharge is effected; what purposes it serves; from what circumstances it may be vitiated; by what means it then becomes injurious, and by what remedies it's disorders may be corrected. But many things are yet wanting in order to give such an account of the menstrual discharge.

771. When by means of the daily increment of the body, certain parts have nearly attained to their proper size, figure, and firmness, they seem by some means to throw the current of the blood on other parts, more lax and not yet evolved, but which are by their fabric adapted to receive in a certain manner, an accession of growth, and to be evolved at length by the assistance of the vital powers of the system (47.). It is probable too, that the ovaries being thus evolved, and become adequate to their offices, secrete some prolific fluids, which by their stimulus, greatly affect the uterus, and parts contiguous; and particularly excite the flow of blood into their own arteries (475.).

772. But it is observed, that in women all the arteries, compared with the veins, are much more capacious and lax than those of men, especially the descending aorta and it's branches, particularly those which are directed to the uterus are more capacious and lax than the rest. Beside, the branches of the uterine arteries being large, serpentine, and full of flexures, seem very much adapted to a congestion of blood; but having by this means become turgid, they open by many small orifices into the uterus, pouring into it the blood which speedily escapes by the vagina.

773. It is probable, therefore, that women are more disposed than men to a fulness of blood. Many circumstances indeed confirm this, especially the fact, that when the growth of the body comes to be retarded, the nutritive fluid, prepared by digestion, is not all expended

on it's nourishment. It is also probable, that the superabundance of blood is chiefly collected in the arteries, particularly in the laxer branches, which admit most readily of distention, and of course in the vessels of the uterus. These again being distended and irritated, are stimulated to new and more vigorous motions; and by small orifices opening into the uterus, and now somewhat expanded, at first express a thin and scarcely coloured fluid, but afterward pour forth pure blood.

774. Although all these things seem somewhat obscure and uncertain, yet they receive considerable confirmation from many symptoms which precede and accompany the appearance of the menstrual discharge: such are a whitish humour flowing from the vagina, recurring at uncertain, often long intervals, for a year or two before full puberty; unusual lassitude, pain of the loins and of the head, vertigo, nausea; swelling, and sometimes pain of the breasts; all returning at intervals, till at length the blood is emitted unmixed; when this takes place, all these disorders disappear, but return at an uncertain period. Thus in girls who have not yet fully attained the age of puberty, the menses often return at distant and uncertain intervals; but are gradually reduced to a monthly period, generally preceded by the symptoms just now enumerated, at one time in a slighter degree, at another more severe.

775. As yet no explanation has been given of so regular an interval; most things however have their peculiar periods, within which they commence and are brought to a close. The power of habit seems to have some place here (317.). The interval, however, is not so regular to all women, but many, otherwise in very good health, have the return of the discharge at shorter or longer periods. But the instances are very rare of women enjoying good health who have no catamenia, and still more rare of such being prolific: some girls indeed have become mothers before these have appeared, but afterwards the discharge proceeds in the usual way.

776. In the lapse of years, in our climate, the men-

ses, and along with them fecundity, rarely terminate before the fortieth year, but generally before the fiftieth year of age. The more quickly they commence, the more early do they terminate: but it is not usual for them to be suddenly repressed. They sometimes return, and in great quantity, at unusual intervals, whether shorter or longer than ordinary; often with severe diseases of the uterus, and of the contiguous or co-operating parts, particularly with fluor albus, and with no slight danger to health. The reason of these things, seems to be the daily increasing firmness and rigidity of the whole system, of the arteries especially, which at last exceed the power of the veins. Hence the fulness of the arteries is latterly thrown on their laxest part; gradually accumulating more slowly, but at irregular periods, and at length ceases. Sometimes, though very unfrequently, the menses and fecundity both remain beyond the fiftieth year: but for the most part, if an old woman have this discharge, it is a disease.

777. Women, therefore, seem to be subject to the catamenia chiefly for this reason, that their whole structure is adapted to accumulate a fulness or abundance of blood, and they have a suitable organ in readiness to discharge it. But men and other animals do not so readily become plethoric, and, were that the case, they have no similar organ. In aged women they cease, because the structure of the uterus undergoes no small change, especially in the firmness of it's arteries. Farther, during pregnancy, a woman has generally no menses, because that part of the uterus, whence they flowed, is occupied by the placenta, nor do they flow during the many months that she suckles the child, because the blood is diverted to another part, between which and the uterus there is a wonderful sympathy.

778. The menses contribute little or nothing to desire. In the age of puberty, the flow of blood to the genital organs being increased, and some fluids (634), as is supposed, being constantly secreted, cannot fail to prove stimulating and heating. But women are less

ardent in their desires than men; and in almost every species of animals the females have less ardour than the males: in some species, the latter cannot cover their females without some degree of force. Greater or less ardour, however, has no effect on fecundity. Sometimes women of rather a warm constitution are observed to be sterile, while the most frigid, who have little or no enjoyment, have an astonishing fecundity. But unbridled and insatiable lust, whether in women or men, is in reality a disease: sometimes corporeal, induced perhaps by organic derangement or irritation of the genital system; by too great a flow of blood, or excessive secretion of fecundating fluids; but more frequently originating in a diseased or corrupted imagination.

779. In a prolific copulation it is probable that not only the clitoris, and other exterior parts of the female genitals, but the internal parts too, particularly the Fallopian tubes, become turgid and erected by the influx of blood; that these tubes are applied to the ovaries, and embrace them with their fimbriae, conveying to them the male semen, and reconveying to the uterus, either the ovum separated from the ovary after it's impregnation by the male semen, or perhaps only the contents of the ruptured ovum mingled with the semen.

780. But whether these things take place in this manner, or at what period, is not as yet accurately known: because the opportunities of observation in the human species are very rare, and numerous circumstances throw doubt on most of the observations which various authors have brought forward. However, so far as can be collected from dissections of animals performed by the most experienced anatomists, or those of a few women, whose bodies there was an opportunity of inspecting a short time after conception, neither foetus nor ovum can be discovered till twenty days after conception: only a tenacious, gelatinous, pellucid humour is discerned in the uterus and tubes, which, however, contains the rudiments of the new animal, though escaping the sight even when assisted

by the best glasses. But as soon as the parts of the crude foetus have acquired so much firmness and colour as to be capable of being distinguished, then the ovum is observed, consisting of a soft and thin membrane, containing a small portion of pellucid water, in which the new animal swims, as yet very soft and almost fluid, pendulous by the umbilical cord from the placenta and membranes of the ovum, bent and shapeless, having the head disproportionately large, and body small, and as yet unfurnished with limbs.

781. That the male semen penetrates by some means through the Fallopian tubes to the ovaries, and that something is derived from the ovaries necessary to generation, and descends by the tubes to the uterus, is evident from the sterility attending tubes not perforated ; from the corpora lutea being found in the ovaries always after conception, never before ; and, in short, from the circumstance of more than one foetus having been found either in the ovaries sticking in the tubes, or dropt from the ruptured tube into the abdomen.

782. That the elements of the new animal are derived jointly from both parents seems evident, from that resemblance of the parents, either of one, or mingled of both, which revives in the children : yet, so that of the children who have a mixed resemblance, some incline more to the father, and others to the mother ; and the father's idiosyncrasy is reproduced in the son, either pure or mixed and corrected : and thus a predisposition to acquire many diseases passes from the parents to their offspring, sometimes nothing impaired, nay perhaps increased, but often milder and slighter, and capable of being gradually eradicated, were equal attention bestowed on the propagation of men as on the breeding of horses, bullocks, or dogs. The greatest diversity found among the human species, that between negroes and Europeans, after a few generations, some say four, is said to be eradicated and to disappear, if the mixed breed intermarry only with one of the races. But numerous varieties, of much less note, such

as temperaments, stature, and shape, features, complexion, colour of the hair and of the eyes, are very easily mixed in the human species, and frequently are long dormant: but they occasionally revive in posterity, and cannot be completely extirpated. For it is evidently the result of profound wisdom, that those minute varieties among men should occasionally reappear, perhaps after the lapse of many generations, as distinct as they had been thirty centuries before: otherwise individuals could scarcely, if at all, be distinguished from one another.

783. Little progress has hitherto been made in attempting to explain the several shares which each parent contributes to generation. Nor is it better understood what is the efficacy of the male semen, what is the use of the animalcules which abound in it, or what is produced from the ovary or corpus luteum. It cannot, however, admit of doubt, that from the very conception, there exists a certain structure of the new animal, however imperfect, though it be not obvious to our senses: but as soon as it does become thus obvious, the foetus has a brain, heart, and aorta, action of the heart, and motion of the blood, though it is not yet red, and of course action of the brain (359.). And surely no one would contend that nothing of all this was present the day before the whole became visible to our eyes.

784. But no man can tell whence come the various parts which are absolutely necessary to life; when, or in what order they are perfected, or how an apparently rude and indigested mass is endowed with such a property as renders it capable of being distended in a certain manner, and of attaining at length the most handsome shape.

785. It is nevertheless worth while to know, that from the commencement of life there exists such a structure, to be evolved in a certain time and order, that there is a great and constant force to distend it, and that the foetus is of the very softest texture, and of course very capable of distention (81, 84.).

786. The distending force is the action of the heart

and arteries, propelling the fluids in all directions through the whole of the diminutive body. This power, it would seem, commencing from the first ventricle of the heart, which is discerned, evolves the aorta, and extends it first into a simple tube, which afterwards divides gradually into small branches, which find, or open, or evolve their accompanying veins.

787. This power seems, by the original conformation of the body, to be directed in different proportions to different organs, and therefore these grow in a certain order, and indeed very unequally. Thus the head becomes large, and the thymus and liver both of a great size, occupy a great part of the thorax, while the lungs are yet small, and no limbs appear. But these come in their order, and the superior extremities are first evolved.

788. The whole man in miniature, when first discernible, scarcely larger than an ant, and weighing one or two grains, swims in the ovum, capable of containing two or three ounces of water: but as the ovum increases in size, it contains proportionally less water, and the foetus is larger, till, toward the end of pregnancy, a small portion only of water remaining, it measures about a foot and a half, and weighs about eight pounds.

789. From the earliest period, a cord proceeds from the navel, consisting of a pair of arteries, with a single accompanying vein, and forms the placenta, which derives the covering of it's concave side from the innermost membrane of the ovum, and that of it's convex side from the external one, is attached both to the ovum and uterus, commonly nigh the uppermost part of each, and effects a communication between the mother and foetus, conveying the blood from the one to the other, and back again.

790. Medical men are not yet fully agreed what is the mode of this communication, whether it subsists by a continuation of the blood-vessels, or whether the blood is poured out of the vessels of either into small cells, and again taken up by absorbent vessels. While

it is a question of fact, and not of argument, it is also of little medical importance. It must, however, be remembered, that an increased impetus of the blood in the uterine vessels often separates the placenta, and of course induces abortion; and this separation, by whatever means accomplished, whether by natural parturition, by abortion, or by great force applied to the umbilical cord by an unskilful midwife after birth, always produces some haemorrhage, sometimes to a great and fatal extent.

791. The circulation in the foetus is observed to be singular, differing entirely from what it is in an adult, being effected through the foramen ovale, and ductus arteriosus, between the pulmonary artery and aorta, and the umbilical arteries and placenta, and the umbilical vein, and ductus venosus, already described (417.), and therefore not requiring to be farther insisted on at present.

792. It is rather uncertain what is the origin of the various coats which form the ovum, whether they are formed out of the fecundating fluids of either sex, in the same way as the foetus itself, or whether they are derived from the uterus. At any rate, the exterior membrane of the chorion, called the decidua, seems to be derived from the uterus, being said to be present in it, when the foetus and ovum are found sticking in the Fallopian tube.

793. The uterus itself grows surprisingly during pregnancy, attaining nearly fifty times the capacity which it had in it's virgin state, yet it is not thereby rendered thinner: for the blood-vessels are evolved, and contain a great quantity of blood, and perhaps the cellular substance, which binds up the muscular fibres, is also increased.

794. It is said that some women, immediately after conception, are apprised of it by a feeling, which does not attend a sterile coition, some attack of rigour taking place straightway, with the accession of nausea the day after, or at most in two or three days. But in the case of the greater part, the os uteri is shut during pregnancy, and they have no menses; and by this symptom

chiefly they know that they have conceived. It is not, however, a very uncommon thing for a woman to have the usual discharge during the first months of pregnancy.

795. Many women have affections of the stomach during all the time from conception to parturition, being distressed with a very troublesome nausea and vomiting, especially in the morning hours. Few, indeed, are altogether free of these disorders, so that they are scarcely accounted morbid. Sometimes there occurs an irregular appetite for food and drink, such as is termed Malacia (645.). Such disorders proceed from the consent between the stomach and uterus, and not from the bulk of the latter pressing the other viscera, for these often commence before the uterus is enlarged, and sometimes cease, or are relieved in the last months of pregnancy, when it is at it's greatest enlargement.

796. Sometimes also other inconveniences not a few proceed from pregnancy, particularly the swelling of the feet and legs, haemorrhoids, and certain disorders of the urine (743, 744.), the cause of which is no way obscure. But some women, in that situation, enjoy the best and most steady health, so that, in their case, pregnancy proves a remedy for many diseases.

797. Pregnancy terminates with the ninth month: in woman the period of gestation is very rarely extended beyond the tenth month. Very few of the children born at six months survive, but they often survive in the seventh and eighth; and the nearer it approaches to the just period, the stronger is the child, and the greater the prospect of it's preservation.

798. The period being at last completed, when the foetus has attained it's due vigour, the liquor amnii is become proportionally less (788.), and the uterus is therefore more stimulated by the weight and motion of the child: the pains of parturition come on, often promoted, it would appear, by the natural tendency to produce the menstrual discharge.

799. These pains, gradually returning with greater frequency, excite a powerful contraction of the uterus

itself, and of the muscles of respiration which co-operate with it, opening at length the os uteri, and propelling the membranes of the ovum through it into the vagina: there the membranes, being ruptured or lacerated, either by the force of the contraction, or by art externally applied, pour out, mixed with a very small portion of blood, the liquor amnii, which relaxes and softens the parts through which the child must pass.

800. The pains then become for a little somewhat more moderate, but in a short time they return with increased violence, and at length, with extreme agony, and a tremor of the whole body, in some cases with convulsion, sometimes a fatal one, expel the child head-foremost. As soon, however, as the head is delivered, the whole body follows with ease.

801. Soon after delivery, the placenta is separated from the uterus, and expelled with the other parts of the ovum, for the most part not without a considerable loss of blood, often to a dangerous extent, especially if any force has been applied to effect the separation. But generally the discharge of blood is soon repressed, or at least moderated, by the sudden and powerful contraction of the uterus: so that the discharge called lochia becomes in a short time more sparing and paler, and at length merely serous. Sooner or later it is stopped entirely, according to the woman's constitution and manner of life: in some women within a day or two, in others scarcely within a month. Sometimes also it recurs when she returns to her usual employments.

802. The body, exhausted and debilitated by pains, by effort and loss of blood, does not immediately recover strength, and partly through weakness, partly through increased irritability and sensibility, it is often severely affected from very slight causes. The attention bestowed on women in childbed is not indeed altogether absurd, but they are much mistaken who view every woman in that state as diseased, and guard them with too much solicitude, not merely defending them from cold and from any severe irritation, but keeping them constantly warm, or perhaps applying medicines to ex-

cite sweat; for such a plan of treatment is not without danger, increases the debility of the system, and renders it more apt to fall into disease.

803. After delivery, the period quite uncertain, the blood, driven from the uterus by it's contraction, is sent in greater abundance towards the breasts, which quickly swell, and begin to secrete milk. On some occasions, such a quantity of blood flows to the breasts that they become very turgid, are inflamed, and suppurate, and thus either the secretion of milk is impeded, or the milk already secreted cannot be sucked out on account of the pain and tumefaction of the breast, which almost conceals the nipple. Sometimes also women, otherwise healthy, have no milk; but this defect is much more rare than is commonly said. For the most part, if the child is put to the breast a few hours after delivery, as nature itself teaches to do, neither is the milk wanting, nor does it come too suddenly; the violent swelling, inflammation of the breasts, or fever, do not come on, and the flow of blood from the uterus is the more quickly stopped.

804. The milk, such as it is secreted immediately after delivery, is thin, contains little nourishment, and, as is commonly reported, purges the child more than other milk; this last, however, is not very certain, but it gradually becomes thicker and more nutritive. When a woman nurses her child, the menses generally do not return for the greater part or the whole of a year: and, during this time, she does not readily become pregnant, though she may not have abstained from venery. If she do not nurse, the menses usually return about a month after delivery.

805. If a woman continue to nurse a child, the milk will remain perhaps for several years. But when the child is weaned, the secretion of milk is soon checked. On the approach of the menses, the milk is observed to agree ill with the child, though, during the discharge, it is often quite harmless.

806. Some women are quite exhausted by nursing, or have bad health. The greater part, however, enjoy

the best health during this period; they have a better appetite, they digest well, sleep well, have a good complexion, and often grow corpulent. Nor is it an uncommon thing for many diseases, especially such as originate in an irregular distribution of the blood (474, 478.), to be prevented or removed during the period of pregnancy or nursing.

807. Lastly, it is worthy of observation, that, though the danger attending child-bearing is not small, women who have born children, and particularly such as have married at an early period of life, and been most fruitful, have longer life and better health than those who are sterile, or who have become mothers at a later period. It is not unlikely that some diseases which distress that lovely sex, and which are not confined to the genital system, but often undermine the general health, are either induced or much aggravated by virginity, a state for which women are not formed: nor is it any way incredible, that the same diseases, from causes not at all obscure, would often be cured by matrimony.

808. In a word, all the functions peculiar to the female sex are often vitiated, not without serious inconvenience and danger to health.

809. It is evidently a disorder when the menstrual discharge does not appear at the usual age. The just period, indeed, varies greatly, without injury to health, as it commonly takes place at an earlier age in warm countries, in those who live in affluence, are luxurious, and indolent, who grow fat, and soon attain their full size: but it approaches more slowly, yet without disease, in cold countries, in girls that are feeble, or of slow growth, accustomed to slender diet or severe labour.

810. But in general, if the menses do not come on at the proper time, the health suffers much. The vigour is entirely destroyed, the several functions of the system are more or less impeded, the appetite fails or is vitiated, digestion is spoiled, the whole body is relaxed, becomes flaccid, pale, and wasted, the blood itself becomes thin and pale, and thus the way is paved for many diseases. This defect of the menstrual eva-

cuation is by Nosologist's denominated Emansio. The lingering state of health arising from it is called Chlorosis.

811. Oftimes, however, after the menses have flowed during a considerable period, at just intervals, they either do not return at the usual time, though there be no pregnancy, or when flowing are suddenly stopped.—This kind of disease is denominated Amenorrhoea, or suppression of the menses.

812. Hence proceed many disorders, but varying according to the constitution of the patient, and many external concurring circumstances; such as fulness of the blood-vessels, first in the uterus, then through the whole body; irregular distribution and increased impetus of the blood; fever; congestions of blood in various parts; discharges of blood from the nostrils, the lungs, the stomach, the anus, and in some cases, it is said, from almost every part of the body; pain of the loins, head, breast, and stomach; vertigo, excessive irritability, sometimes hysteria, at length general debility, all the functions impeded, and health universally impaired.

813. The various causes of the suppression or retention of the menses, are the more worthy of regard, that on the thorough knowledge of their nature, the cure of the disease, and restoration of the discharge, chiefly depend.

814. Sometimes, perhaps, but very rarely, the menses may be defective through the depraved structure of the uterus, by which it is rendered inadequate to collect and pour forth the blood; sometimes also, though not much more frequently, the blood being effused in the uterus, is there detained, the passage from the uterus being preternaturally impeded.

815. There is a more frequent case, in which the fabric of the organs is entirely sound, but the menses do not appear at the usual age, either through some defect of that state of the ovaries, on which depends the secretion of the prolific fluids, which seem to be stimuli to the uterus (771.); or, because the body is not well

nourished, is exhausted with severe labour or bad health, or in a word, because it is debilitated exceedingly from whatever cause, so that either no abundance of blood can be produced, or if produced, there is no force present to direct it to the uterus, or to propel it through it's vessels. From the same cause, the menses are often suppressed in women who formerly had them in the natural way.

816. The menses when approaching are often impeded, or suddenly stopped when flowing, by a variety of causes which may either induce such debility, as already mentioned, or contraction, or spasm on the uterus or it's arteries, or may divert the blood another way: such are violent passions, whether exciting or depressing, cold, especially applied to the feet, great evacuations, strong medicines, in a word, various diseases. The menses are also the more readily impeded when about to flow, or their flow checked by seemingly very slight causes: and the suppression proves the more injurious, because, while they are approaching or flowing, the whole system possesses an unusual degree of irritability.

817. Hence it is easy to account for the fact, that numerous and very different remedies, either induce or restore the menstrual discharge, or alleviate the disorders proceeding from it's suppression; namely, those which produce fulness, or depletion; which corroborate or relax; which stimulate or compose; or direct the blood to the uterus; such as a more generous diet, blood-letting, stimulating medicines, as black hellebore, or warm gums, the electric fluid, exercise, the bath, fomentations, opium, &c.; and it will neither be any surprise that all remedies, even the most celebrated, often disappoint the practitioner; nor at all credible, that any remedy will ever be discovered by accident or research, which will always prove effectual for the cure of a disease arising from such a variety of causes, and injuring the system in so many different ways.

818. Farther, the menses not rarely exceed in quantity, or recur too frequently; and both disorders are often joined, being both occasioned by similar causes.

819. The causes which most commonly produce this disorder, are a superabundance and increased force of the blood, especially directed towards the uterus, either by stimulants applied to this and the contiguous parts, or by spasm, or some contraction induced on other remote parts (475, 476.); the return of the blood from the uterus by the veins, impeded by various obstructions; the laxity and debility of the uterus and it's arteries, occasioned by frequent pregnancy or abortion; or, various uterine diseases, as ulcer, erosion, or cancer.

820. It is therefore perfectly clear why this complicated disorder sometimes requires various medicines, or such as may seem to possess opposite qualities; such as venesection, slender diet, relaxing medicines, corroborants, refrigerants, anodynes, &c.

821. Such discharge exhausts the body, relaxes the solid parts, attenuates the fluids, debilitates the uterus, induces fluor albus, renders women either sterile or prone to abortion; in a word, impedes all the functions, undermines the general health, and though it seldom proves hastily fatal, it is sometimes the origin and cause of diseases generally incurable.

822. Somewhat akin to this is a very troublesome disorder, common to the female sex, which is named fluor albus: being a discharge of a whitish fluid from the vagina.

823. This disorder often attends menorrhagia, and in that case, usually precedes and follows it; when the arteries, and pores opening into the uterus, are not yet so dilated as to permit the effusion of the thick and red blood, it's thinner part alone passes, and being somewhat thickened while on it's way, and perhaps otherwise changed and mixed with mucus, escapes from the vagina. In like manner, after the same vessels and pores have been again somewhat constricted, and retain the red blood, the thin and whitish humour continues for some little time to flow. But the disorder being aggravated becomes constant, and occupies the whole interval of the menses.

824. Like menorrhagia, this disorder debilitates

the uterus, exhausts the system, often renders the woman sterile, and undermines the general health. It most commonly originates in menorrhagia, which had debilitated the uterus, relaxed the whole body, and attenuated the blood ; it proceeds from almost the same causes (819.), and is often checked by similar remedies. Yet in not a few instances, it proceeds from deficiency or suppression of the menses. Women affected with such a disease, do not so readily become pregnant as those in good health, or if they are impregnated, the foetus often passes off quickly by abortion. But if such a woman happily complete the period of gestation, the disease under which she formerly laboured, is commonly checked, and perhaps will never return, especially if after delivery she adopt a suitable mode of life.

825. In short, though the menses be neither suppressed nor flowing too copiously, and though they observe the usual and natural intervals, it is nevertheless a disease when the discharge takes place with difficulty, with pain of the uterus, loins, or head, and with severe agitation of the whole system. Many women, who in the first years of puberty had experienced no such inconvenience, or only in a very slight degree, while they are in the vigour of life, still fresh, and otherwise in good health, generally suffer in this manner, as often as they have the discharge. This inconvenience, proceeding from increasing firmness of the solid parts, or from too great contraction of the uterine arteries and pores, is most effectually relieved by anodynes and relaxing remedies ; and one must not rashly have recourse to heating, stimulating, or cordial remedies, such as the good women love to prescribe ; although indeed, remedies of these descriptions, by quickening the circulation, may overcome that resistance which arises from the firmness of the uterus, and contraction of it's arteries, and may thus promote the discharge.

826. Sterility is also a disease, when it takes place during the period when a woman may be expected to be fruitful. This sometimes happens through a bad conformation of the uterus, tubes, or ovaries, such as dis-

section has discovered in some, though in very few instances; and which did not permit the male semen to penetrate to the ovaries, or the female substance, be what it will, necessary to generation, to be mixed with it, or which interrupted the due communication with the uterus; such as we may suppose an obstructed or schirrous uterus, impervious tubes, or ovaries become dropsical, &c.

827. But the sterility of women is more frequently owing to disorders of the menstrual discharge, as suppression, menorrhagia, or fluor albus, which either prevent conception, eject the foetus while yet fluid, or impede it's due and natural nourishment, by the placenta and vessels of the umbilical cord.

828. The fluids also which women contribute to generation, whatever they be, may be depraved, and their fecundity destroyed in the same manner as the male semen (765.). Excessive indulgence in venery also commonly produces sterility.

829. Fecundity depends greatly on the original and congenital constitution of body; being found to a surprising degree and almost uniform in certain families, while some ancient races have for many generations produced but one son only.

830. Indolence and luxury of every kind, either gradually render persons sterile, or they produce a feeble and diseased offspring, which with difficulty survives infancy, and seldom reaches manhood. Thus the peasantry generally abound in a healthy and vigorous offspring, while the inhabitants of large towns are often either childless, or the parents of a wretched progeny. The country alone is fertile in men, whom it rears, not for itself only, but for the cities too, which would otherwise be empty in a short time; for the instances are few of families of artificers flourishing for four generations. Farther, the most celebrated and ancient families of nobles and princes are daily diminishing and perishing; so that in a short time there would not be any nobility left, were not intermarriages made with commoners, and commoners raised to the highest honours, and united with the ancient families; though it

is beyond a doubt, that a father, very different from the legal one, has often improved a noble stem, when loaded with the mental and corporeal disorders and diseases of twenty generations, and sometimes revived it when ready to become extinct.

831. Though the constitution of either parent, being ruined by indolence and luxury, may contribute to this degeneracy or sterility, it is sufficiently evident, that the chief fault and cause of sterility is often in the females, who, by such a mode of living, become relaxed, greatly debilitated, and plethoric; have the menses, of course, more copious than rustic or robust women usually have, and are frequently afflicted with fluor albus, menorrhagia, or amenorrhoea.

832. Abortion denotes the expulsion of the immature foetus; a disorder of very frequent occurrence, which takes place more frequently in the third month; being several times repeated, it readily becomes a habit not to be broken off without the greatest difficulty: and is generally the more dangerous, the more nearly it approaches to the full time.

833. It proceeds from nearly the same causes as menorrhagia, of which it is frequently a part and effect; generally taking place, if owing to any thing internal, at the period of the menses, and apparently in consequence of the usual effort of nature to produce them. Besides, whatever interrupts the communication between the mother and the foetus (789, 790.), or stimulates, debilitates, or in any way hurts the uterus, agitates the nervous system, or heats the body, may induce abortion: such as an increased impetus of the blood, especially in the uterine vessels; violent fever, which seldom takes place indeed in pregnant women, and hardly ever without danger of abortion and hazard of life; severe exercise, fatigue, violent effort, or external violence to the body, particularly the belly; excessive venery, irritation of the contiguous parts, by strong medicines; violent mental affections, whether exciting or depressing; great debility, whether general, or of the uterus only; or syncope, from excessive evacuations;

and, in fine, some faults of the foetus itself, as it's monstrous bulk or figure, inconvenient position in the uterus, diseases rendering the circulation through the placenta languid, or it's death, which finally stops all motion of fluid through the placenta, and interrupts all communication with the mother.

834. The mode, therefore, of guarding against the impending danger is no way obscure,—by blood-letting, a recumbent posture, tranquillity of mind and body, anodyne remedies, cold applied to the body in various ways, and other remedies administered as circumstances require. Nor is abortion, or the loss of the child, always inevitable, though there has been a discharge of some water, or even of blood; because the placenta, though partially separated, may again grow to the uterus, and the liquor amnii be again supplied.

835. But when it has come to the full time, the delivery is often rendered difficult, laborious, or dangerous, by many causes, which it is incumbent on the accoucheur carefully to weigh, in order to devise suitable aids against them. It will be sufficient to notice here, that the natural and most happy delivery is not altogether without pain, or some degree of danger: but, in general, the danger and pain are alike increased in the case of young women, and of the first labours of the more elderly; because, in the former, the parts which suffer in parturition have not yet attained their just magnitude, conformation, and strength; and in the latter, the too great rigidity of all, renders the passage of the foetus more difficult. But there is the most imminent danger, when the structure, either of the uterus, or of the bones of the pelvis, is bad; so that these cannot transmit the foetus, and the uterus can neither exert sufficient force, nor endure that force without danger of laceration. Also, delicate, feeble women, of great irritability, impatient of pain, or exhausted by disease, are in greater danger than those who are healthy and strong. Farther, the various imperfections of the foetus, placenta, or cord, often render the delivery difficult, sometimes obstruct it entirely;—as it's deformity, large

head, or preternatural position; the placenta adhering to an unusual part of the uterus; the cord too long, or preternaturally twisted round the foetus, &c. There may also be a concurrence of many disorders of that kind in the same case, producing various unexpected difficulties in the way of delivery.

836. In fine, after delivery, the lochia often flow in excess, or are suddenly suppressed: the cause and bad effect of either of these will be readily understood from what was said (815.), especially if we attend to the circumstance, that the body, exhausted and debilitated by the pains of labour and loss of blood, becomes very irritable and easily agitated; and that the uterus, a very delicate organ at any rate, being greatly irritated, is rendered prone to inflammation: whence it often happens, that the slightest causes often deeply affect women in child-bed, and induce violent fever, or inflammation of the uterus, which sometimes extends to the contiguous viscera, and is ready to terminate in gangrene. An account has already (803.) been given of the most frequent disorders attending the secretion of milk after delivery.

837. It is to be observed, that the more the business of parturition and nursing is committed to nature, it is generally attended with the happier success; this is now acknowledged by the most skilful practitioners of the obstetric art; and they who alone know how to give assistance, trust little to art, and much to nature, except in the rare instances already enumerated (835.).

CHAP. XXII.

Of the nutrition and increment of the body, it's acme, decay, and death; and of the diseases incident to the different periods of life.

838. ANOTHER of the arcana of nature here presents itself, scarcely less astonishing than generation, and in no degree better understood, though performed more under the eye: namely, the child, though small, feeble, equally impotent in body and mind, gradually increasing in size, attaining to the most beautiful and perfect shape, and at length the full possession of all the faculties of body and mind (14.).

839. For some time the human body retains it's vigour and perfection, in shape, health, and strength; but in the lapse of years, it sinks slowly into ruin (12.); the flower of youth, the force of mind, and vigour of body perish. Envious time consumes every man, even the most robust, by a disease irremediable, which assembles all at the same goal. And, indeed, so great and incessant are the calamities to which old age is exposed, that, were men wise, death itself would come to all an object of desire, as the end of all their miseries.

840. Philosophers and medical men have endeavoured to account for these things, and to explain how the body receives it's nourishment, why it increases during a certain period, why it ceases at length to grow, and at last decays in it's appointed season. Although, in this matter, there remain as yet much obscurity and uncertainty, yet it is necessary to know what has been advanced on such an important subject, what is proved, and what is mere conjecture. Besides, as numerous diseases depend on the age, being induced by the changes which the body undergoes at the various stages of life, it there-

fore becomes requisite for practitioners to understand their nature and causes (22, 51.).

841. It is manifest from very accurate and simple experiments, that all parts of the body, both solid and fluid are, by the various functions of the living system, in a constant course of being dissipated and worn down. And there is no doubt, that the aliments which we use repair this loss. These, again, are first masticated, dissolved, and digested, in the mouth, stomach, and intestines (615, 16.); then perhaps farther changed in the lungs (566.); and at last converted into blood (494, 505.); the gluten of which, that is the fibrine, albumen, and gelatine, seems to form the nourishment of the solid parts.

842. It is easily understood how the fluids of the body may be repaired by such a supply; but the manner in which the solid parts are recruited, is much more obscure.

843. Some authors, and those not of slender reputation, are of opinion, that, in the solid parts, the vessels, fibres, bones, and cellular texture, the particles being worn down by the various functions of life, leave small indentations or pits; and that these indentations, suppose in the inner surface of some blood-vessel, are filled with the glutinous humour which is flowing past; that it attracts to it the gross part of that humour, and parts with the thin, being assisted in this operation by the incessant motion and compression wherewith all the parts are agitated; that, if the indentation is not entirely filled up, the smaller hollow which now remains, attracts to it and detains an additional portion of the gelatinous fluid; but if more has been attached than was requisite, so that any frustum, or the smallest excrescence becomes prominent in the middle of the tube, it is speedily worn down by the current, until the internal surface becomes smooth and uniform as before. These authors were also of opinion, that the external parts of the vessels, and cellular texture, the fibres of the nerves and muscles, and, in short, the bones, are nourished nearly in a similar manner, either by minute vessels, carrying and

applying gluten and earth, or by the exhaled (437.) gelatinous fluid that bedews all the cavities of the body: and that the thinner part of the nutritive fluid being strained, exhaled, and taken up again, the solid matter is at last left, in such quantity and quality as that which had been wasted.

844. They thought they had found an instance and demonstration of such nutritive process, in the closing of a wound, as that of a small artery, which coalesces of it's own accord, and generally in such a process as this, that it is speedily filled up by the gluten effused and concreted into a mass, which restrains the flux of blood, and repairs the artery itself, so that in a few hours the fluids again flow through it as before, without spilling a drop: that whatever portion of the glutinous mass is prominent within the artery, the current of the fluids carries it along with it: and that the motion compresses what remains into a firm substance, and the thin expressed fluid is taken up by the absorbent vessels. But the glutinous mass which is formed about a wounded artery, is not so suddenly rubbed away; though, in many cases, it gradually diminishes and vanishes, especially if the wound was slight: yet, in some cases, as in a severe wound, the structure of the vessels, and of the other parts which had been wounded, receives such injury, that it is never completely repaired; but a scar is left greater or less, which perhaps is never entirely obliterated, and, in some cases, becomes the more unsightly.

845. Nevertheless, these and similar theories, are far from giving a satisfactory explanation of the nourishment of the body. Though there is no doubt that the nutritive fluid is conveyed to all parts of the system by the arteries, and that the various motions of these, and of the muscles, in some degree compress the arteries themselves, the contiguous parts, and, indeed, all the parts; yet, it is not easy to understand, how materials so various, differing in some degree in their elements, and entirely in their qualities and structure, are capable of assimilation and apposition to the various parts, such as

the teeth, the bones, the nerves, the muscles, cartilages, ligaments, cellular texture, &c.

846. For in the bones there is a great proportion of earth, very little of which is found in other parts. And, in general, they are not subjected to so much pressure as some soft parts, the arteries for instance. Farther, owing to a disorder, observed in some rare instances, too little of that earth is deposited in the bones, which, of course, become soft : and sometimes, on the contrary, the osseous substance is deposited in other parts, such as the muscles, the viscera, &c. so that if the wretched patient so affected should live, he might, perhaps, become wholly bone.

847. Besides, the minute and very delicate organic structure, such as that of the nerves and muscles, is preserved during the process of nutrition, so that it's peculiar vital properties are secured to every part, which could scarcely be effected by such a contrivance as these authors have imagined, which would only supply a rude and indigested mass, in place of the very beautiful fabric which was worn and wasted.

848. Other very eminent men have supposed that nutrition is effected by means of the nerves, and not by the arteries; and that the gluten of the blood being secreted in the brain, attenuated, and completely purified from every salt that might corrupt it, is somehow percolated through the nerves, and conveyed to the various parts, aided and propelled by some very subtle, active, and exquisite fluid, supposed to exist in the nerves.—Many suppose that vegetables are nourished almost in the same manner, although it is not yet quite evident that such is the case; and many things rather go to prove that they receive their nourishment in a very different way. Neither indeed is it yet agreed that the brain secretes any fluid, that any such exists in the nerves, or that any thin and pure gluten percolates through them; for they neither swell when they are tied, nor effuse any fluid when cut; nor could a vapour so very subtle as was supposed, both formerly and of late, to be in the nerves, propel such a humour, thicker, at any rate, than

water: nor is nutrition accomplished by means of the nerves; for the ovum, the placenta, and umbilical cord, are nourished and grow without nerves, and there have been instances of a well grown foetus born without a head; and, in cold-blooded animals, much more tenacious of life than man, the limbs, such as the leg and thigh, are completely nourished, and do not fall off in flesh, though the great nerve which is distributed on them be cut. And, in a word, it is no better understood in what manner it's own peculiar matter (845.), and in it's peculiar fabric, can be supplied to each several organ by the nerves, with more ease than by the arteries.

849. Whatever be the true state of this matter, it will always be of advantage to know, that nutrition is much affected, and either promoted or impeded, not only by the state and action of arteries and nerves, but by many other more obvious circumstances. When the circulation in any one artery is obstructed or diminished, the limb which this supplied becomes cold, torpid, and emaciated, until the circulation be restored, either by it's ordinary channels, or by new ones, perhaps by communicating branches, which it soon finds out for itself. Sometimes, however, the limb, after such obstruction, never becomes so brawny as before. By bloodletting also, in very large quantity, the whole body loses it's flesh.

850. Often in palsy too, whether general or partial, the parts affected are wasted, which is always a bad symptom, and shews that the cure of the disease will be very difficult, if not impracticable. Such wasting of a paralysed limb, may take place, either from the utter loss or diminution of the power of the arteries, along with that of the muscles, which sometimes happens; from the constant rest of the limb, which, without palsy, or any fault of the circulation, or indeed any disease, would cause all the parts, particularly those which are muscular, to lose their flesh, just as the proper use renders them brawny or fleshy; or, from the defect or depravation of that power, if indeed it be in the nerves, which repairs the loss of the solid parts by the apposi-

tion of new particles. Some parts also become wasted, and perhaps never recover their bulk and vigour, from a great loss of blood by severe wound, or ulcer infesting them for a length of time.

851. Nutrition depends much on the quantity, and no less on the quality of the food which we take, according as the same bulk or weight of it contains more or less nutritive matter. It depends also greatly on the perfect or imperfect digestion of the food.

852. As a person in good health is usually well nourished while he enjoys a competent supply of suitable food, so they who are in bad health, are, for the most part, badly nourished, and frequently and suddenly wasted; because, while any one is sickly, he seldom enjoys a good appetite, and still more rarely a good digestion; while he is often exhausted by an unusual loss, the fluid parts of the body being dissipated beyond measure, and the solids much wasted by the violence of the motion to which they are exposed, which is especially observed in all fevers. Nor does the opinion seem any way absurd, that the greatest number of diseases, especially such as are attended with an increased impetus of the blood, obstruct nutrition, by impeding the apposition of new particles.

853. There is no doubt, that the greatest part of the weight which patients lose during sickness, is fat (101, &c.), which is very readily consumed, and often speedily repaired. But some cases have proved, that all parts, both solid and fluid, are sometimes consumed, being worn down and dissipated more quickly than new particles could be applied.

854. At a certain age we are nourished precisely without increase or diminution: the daily loss being repaired by daily nourishment. But in early life we grow much and fast: in more advanced life, we grow fat, but do not increase in stature. In the last period, we decrease again, and are contracted, and the very bones seem to be diminished.

855. Neither is the reason of these things so difficult or obscure, as the explication of nutrition itself. For,

when it is once admitted, that there is a power or faculty, which applies new matter to the system, and wears down and ejects the old, it may, from the state of the body at various periods of life, be in some measure understood, that the body would for some time be increased; that however, at a certain period, it would cease to grow, and at length begin to decrease, and be from day to day diminished, till it's functions being entirely obstructed, life itself should fail.

856. In infancy, and the same character applies to the foetus in utero, the body is indeed very soft and capable of extention, and there is present a powerful force, commencing almost from the centre of the system, which distends the whole: namely, the heart, much larger in proportion than in the adult, possessing far greater irritability, and a much more frequent pulse. The blood-vessels too are more numerous, softer, and more irritable, than in advanced life.

857. By this power all the arteries, and all the parts connected with them, that is, the whole body, are somewhat distended, an hundred and fifty thousand times every day; and there is not in the solid parts of the body, while it is yet soft and delicate, such a degree of elasticity, as that the parts should instantly recover their former position and bulk: and new matter being deposited during the distention, they are not only extended, but continually grow, and being hardened by incessant pressure, acquire more firmness and vigour, and thus giving more resistance, they are afterwards extended with greater difficulty; especially as the distending force is not itself increased in proportion. Besides, that force being diffused over a greater mass, though that mass had been of the same firmness, must have less effect, because all the friction, and the resistance from the weight of the parts to be moved, are increased along with the mass of the body.

858. Thus the body grows for some time, but at a rate somewhat slower every day. During the nine months which the foetus passes in the uterus, he attains the stature of a foot and a half; at the end of three

years, that is in four times the former period, he acquires another foot and a half; but, in the fifteen or twenty following years, if he continue to grow so long, the youth having now reached his full stature, scarcely exceeds six feet.

859. Neither yet do all the parts grow equally: some having been early formed in the foetus, and having attained a considerable size previous to birth, either grow more slowly afterwards, or are decidedly diminished; while many other parts, such as the thorax, the lungs, and limbs, especially the lower extremities, acquire a great and sudden increase beyond that of the other parts.

860. Thus, various proportions of the trunk, of the body, and of the limbs, are characteristic of different periods of life; a fact with which painters and sculptors are well acquainted, so that a colossal statue, of an hundred feet in height, might represent a child of three months old, while an image, half an inch long, might exhibit a tall full grown man.

861. The head, for instance, in the crude foetus, is a third part, or perhaps a half of the whole, in the child, a fifth or sixth part, in a boy a seventh, in a well proportioned man scarcely a ninth part of his whole length. The more quickly that any part of the body is, by it's original constitution, evolved, and grows to it's just size and shape, the more early does it attain to such firmness and elasticity, that it does not admit of farther distention, and directs the current of blood to other parts of less resistance, and more capable of being distended. Hence, in some degree at least, the puberty of both sexes, and sometimes an astonishing and sudden increment, particularly of the limbs, at the very time when the superior parts, the head especially, commonly cease to grow.

862. Farther, the body does not immediately grow in every direction. The youth perhaps reaches his full stature in his eighteenth or twentieth year, but is still slender, of a shape very dissimilar to that of a full grown man, and of inferior strength. But he gradu-

ally acquires another increment, and another shape; becomes square and brawny, having a more ample chest, the shoulders broader, the bones larger, and the joints of the limbs more vigorous.

863. It is probable that the several parts of the body increase first in length, because the distending power acts chiefly in the direction of the axis of the vessels, till these being much distended, and acquiring more firmness, daily offer more and more resistance, and admit of no farther distention. Then, indeed, the same distending power is diffused in every direction through the branches proceeding from the great trunks, which are, of course, extended themselves, and, at the same time, extend the parts with which they are connected.

864. Many other circumstances concur in the earliest period of life, which greatly promote the increment of the body. There seems to be present a certain abundance of blood, and that indeed by no means owing to any disease, which completely fills and distends the blood-vessels, especially the arteries, because, at this period, the veins possess much more power than the arteries (444.); besides, this abundance of blood not only distends the vessels, but also supplies more nourishment than, without growth, would be requisite for recruiting the body: there is no room to doubt, that the greater part of children would be very plethoric, unless either the abundance of blood which they have were expended to this purpose, or that they took a great deal of exercise, for they use much more food in proportion than adults, they have an excellent digestion, they sleep much, are of a lax habit, and, of course, have a tendency to become plethoric.

865. And, indeed, though that fulness is by no means injurious, so long as young persons are growing, provided it be not very great; yet as soon as they cease to grow, it often shews itself by manifest symptoms, and, if the young man be of a feeble constitution, not unfrequently induces very severe diseases.

866. An end is put to the growth by the increasing bulk and rigidity of the whole body, and especially by

the arteries becoming more rigid from incessant action and compression; by the firmness of the bones; and, as celebrated authors think, by the great resistance of the cartilages which cover their extremities, which are now greatly compressed by the growing bones, and cannot endure further compression.

867. A just equilibrium being at last established between the distending and resisting powers, and between the arteries and veins, the body for some time neither advances in growth, nor suffers diminution. But from that time, it acquires another kind of increment not so real, in a great quantity of fat, secreted and collected under the skin, in the abdomen, and between the muscles, for which a reason was assigned in the proper place (101, &c.).

868. But the body returns again by little and little to an emaciated state, when not only is the fat absorbed, but almost all the parts are but imperfectly nourished. Now, indeed, all the solid parts are every day becoming more rigid, and the arteries especially, which also become more contracted, and many of the lesser branches are entirely shut up; the resistance too is greater in every part of the system; the circulation more languid, and somewhat impeded; the irritability of the heart and arteries is impaired, and their pulsation slower and weaker; the veins have more than their due proportion of blood, and the arteries less; the most of the functions are impeded, all the powers fail, and the whole machine sinks in all it's parts.

869. It cannot, therefore, be doubted, that sooner or later, life itself would prove the cause of death. But few are carried off by this natural and inevitable death, the result of age alone: for the numberless diseases which beset the path of life, have always snatched away the greatest part of the human species, so that scarcely one in ten completes seventy years, and scarcely one of a thousand ninety; and the far greater part of those who reach longevity, do not die of mere old age, but are swept away by the various diseases to which that period of life is obnoxious.

870. The circulation becoming languid, through the rigidity of all the solids, and the torpor and debility of the moving powers, the heart also being no longer adequate to it's proper office, the motion of the blood ceases first in the extremities, while it yet remains in the chest, the trunk, and the head. Becoming now defective in the lungs, it induces a certain panting and (600.) laborious respiration to promote the transmission of the blood through the lungs. When this effort also becomes inadequate, and the strength is completely exhausted, a long full expiration spontaneously succeeds the last inspiration; and all the vital functions ceasing at once, life is readily, and without a struggle, exchanged for death.

871. But, besides this death by age in the course of nature, which is accounted the rarest of all (869.), there exist various species of it; as there are various and almost innumerable causes, which may derange and bring to it's end a machine so delicate and complicated, and preserved by so many functions, as is the human body: especially as it's various parts and functions are so joined together that the one part of them are evidently sustained by the other; and therefore, if any injury happen to any one of them, the powers, not of that part only, but perhaps of the whole machine, sink together.

872. But neither does the subject itself require us to enumerate all such causes, nor does the design of this work permit it. It may suffice to take notice, that they are very numerous, and press on every side; yet, for the most part, perhaps in all cases, unless through the speedy approach of death, there be no opportunity for observation, whatever be the origin or more remote cause of the disease, some of the vital functions, namely, the action of the brain and nerves, circulation of the blood, or respiration, are found impeded or injured, or at least affected in some unusual way, before life is utterly extinguished. But because there subsists, as already explained, a very close connection between these

functions (411, &c.), when one or other of them is injured, they usually all suffer together.

873. It is likewise evident, from the symptoms which attend the failure, obstruction, or various disorders of these functions, that in the most part of diseases the practitioner can foresee instant danger to the patient, and either apprise him of death, if no hope remains, or if the injury be not, either by it's nature or magnitude, altogether incurable, then, by employing suitable remedies, the wretched patient may be recalled, as it were, from the dead.

874. It is therefore both becoming and necessary for the physician to know the signs of approaching dissolution. Though these indeed vary considerably in different diseases, and are often uncertain, not only when taking place singly, but when a great number are conjoined, yet for the most part, in the same diseases, they are both sufficiently uniform, and more than sufficiently sure: especially if the practitioner direct his attention not only to the manifest symptoms, but at the same time to the nature and cause of the disease, and the condition of the patient.

875. In the first place, then, great debility (380.), when not only sudden, but still on the increase, so that the patient can neither turn himself nor sit upright in bed, when he cannot speak, take food, or swallow, owing to the jaw falling, and the proper power of the oesophagus being lost; tremors, contractions, or convulsions of the muscles or limbs; the defect or loss of any of the senses, either external or internal, especially sight or touch; stupor, torpor, severe delirium, in most diseases whether acute or chronic, are unfavourable signs.

876. Again, the pulse, when much disordered, becoming very quick or very slow; unusually strong, or very feeble, obscure and scarcely perceptible, or irregular and intermittent; with a countenance pallid and sunk; the brightness of the eyes extinguished; extremities cold, sweat cold and clammy, foam at the mouth,

and great anxiety, for the most part points out extreme danger, often instant death.

877. Respiration, likewise, when become imperfect, difficult, laborious, or rattling, where the organs of respiration had not formerly been affected, is a very bad symptom.

878. Also in many chronic diseases, and sometimes in acute ones, there are observed, some time before death, great emaciation, a cadaverous aspect, and what is denominated Hippocratica facies, and, in diseases of both classes, an uncommon foetor, and at length a general putrescency.

879. These and similar symptoms, indeed, happen in various diseases, and clearly shew their magnitude and danger. But many others shew themselves in different classes of diseases, differing widely according to the nature of these, and the parts of the body which are chiefly affected, from the very first demonstrating their danger, and perhaps, in some cases, their incurable nature.

880. But those symptoms (874.) which are accounted the most unfavourable, and for the most part fatal, are frequently void of danger, either as proceeding from slight and temporary causes, or at least from such as readily admit of cure: as in hysteria, asthma, scurvy, certain intermitting fevers, and many other diseases.

881. The cause of death, at least it's full and proximate cause, must always be the same, as what undoubtedly lies in the loss of that unknown condition of the nervous system, by which life, so far as it is corporeal, seems to be produced. But because that state is hitherto altogether unknown, it is quite evident that the proximate cause of death, being nothing else than the extinction of that state, must be equally unknown.

882. Farther, the more remote causes of death, namely, such as induce that unknown state of the nervous system, are little better understood in the far greater number of cases, and cannot be discovered even by dissection. For it appears that the power of the nervous system often fails, while it's structure remains whole and sound, so far as it is exposed to examination by

our senses and the dissecting knife. Such examples are daily observed in the bodies of those who are cut off by certain fevers, and many similar diseases, by palsy, convulsion, or gangrene; by various poisons received into the stomach, the lungs, or the blood; by lightning; by violent passion; by sudden death; or, in a word, by external violence affecting the head or stomach.

883. Great injuries, however, either of the brain itself, or at least of some part of the nervous system, are frequently discovered in dead bodies, which are commonly, though rather inaccurately, accounted the full and proximate cause of death; as when the neck or skull has been broken, or the brain compressed or otherwise hurt, whether by the depression of any part of the skull, by tumours within the head, or by blood, serum, pus, or water effused within it, or merely by the unusual turgescence of the blood-vessels, as sometimes takes place in epilepsy, apoplexy, palsy, dropsy, and certain fevers.

884. In many instances too, obstructions of other vital functions, and sometimes even considerable injuries of the structure of the parts subservient to them, are detected, and are deservedly accounted a cause of death, though not the proximate cause, in the sense already explained; as when the heart or any large vessel is ruptured, eroded, or obstructed, or the lungs inflamed, or filled with blood or serum, with mucus, pus, or water, or when they are impeded by tumours of the neighbouring parts, or by a great quantity of water collected in the chest, and in other similar circumstances.

885. In many cases, however, no injury can be detected, either of the nervous system or of the parts subservient to the circulation or respiration, but merely some organic derangement in the natural functions, or at least some blemish, either naturally general, or first infecting some particular part of the system, and then gradually corrupting the whole: whence certain vital functions are impeded (8, 9.), health impaired in every respect, weakness is daily on the increase, and death at length becomes inevitable.

886. Provident nature has taken care that this *ultima linea rerum* should not be without it's peculiar terrors, nor is her purpose any way doubtful in giving mortals such a constitution that, with the utmost repugnance, they exchange this life, oppressed with all it's load of calamities, for another that is unknown. But mankind are much mistaken, and fatally for their own comfort, when they aggravate the terror of death, and persuade themselves that it always brings along with it the severest anguish, and that none can die without extreme torture. This, indeed, may appear the more probable, for this reason, that excessive pain sometimes cuts off the sufferer, and dying persons are often much agitated, and pant and groan, and are convulsed, as if suffering the greatest agony.

887. But notwithstanding these things, both reason and observation abundantly demonstrate, that there is never any feeling of dying; that the causes which extinguish life are often such as can give neither pain nor sensation; and that for the most part, long before the dying person draws his last breath, the condition of the body is such as to preclude pain and every other feeling.

888. Particularly in the case of those who are carried off by mere old age, which kind of death alone deserves to be called natural, death is placid; for there is no violence applied which could tear them from life, and they cease to live, as a ripe apple drops spontaneously from the tree. Besides, in these there is usually such a stupor, that all feeling seems allayed and extinguished long ere life departs. In fact, there neither appears to be in these any cause of pain, nor have any symptoms of it been observed when they were expiring.

889. Farther, nearly the same account is to be given of the death of those who are carried off by various diseases in the vigour of life. No doubt while the powers of life and the senses remain entire, these diseases, such as fevers and the like, occasion a superabundance of pain and trouble; but when once it is come to extremities, the strength being wasted, and every sense al-

most destroyed, there neither can be any violent cause of pain, nor, if such existed, such is the condition of the body, could it excite any pain.

890. But the cause of death is often such as not only creates no pain, but even stupifies and takes away all feeling. Thus many diseases are lethargic, in which the patient never complains of pain, scarcely of any uneasiness. Syncope, too, is often prolonged till it terminate in death ; nor in either case, does there seem to be present, either pain or feeling of any kind. Sometimes also, those who have gone to sleep in full health and vigour, have died with their slumbers unbroken.

891. Again, in those cases where death is most violent, whether the cause be internal or external, the extreme celerity of death entirely takes away all feeling of dying.

892. It is evident enough, that many diseases, and other causes of death, produce great pain, uneasiness, and anxiety : as when great violence is done to a sentient part, or inflammation comes on, or, in fine, when some actions necessary to life are impeded, which last often happens from mere debility. Nor indeed must it be denied, that in this manner, many have been aware that death was just at hand, and therefore, have courteously taken leave of their friends and byestanders, almost in the moment of death. But we must always recollect, that such troublesome feeling was present during life, not at death, and that in general it ceased and became extinct before the dying person breathed his last. On the whole then, it seems we die, just as we fall into a fainting or convulsion fit, without pain or any feeling, though we are often conducted to the brink, by various causes capable of inflicting the greatest torture.

893. Perhaps at first view, it will appear ridiculous to appeal to testimony on such a subject ; but there are many instances of persons restored to life, after being apparently lifeless, and that by many and very different kinds of death ; while they neither shewed any signs of life, nor was it credible that any feeling was left ; that such persons usually have no recollection of severe pain, or un-

easy feeling, not even when they had been agitated by the most violent convulsions. There seems, therefore, to be no absurdity at all in the beautiful sentiment of a celebrated and elegant author, that in regard to feeling, the beginning and termination of life is similar; that neither was the one attended with pleasure, so far as we remember; nor is the other, so far as we know or can conjecture, necessarily attended with pain.

894. The soul having taken it's flight, the whole corpse becomes cold, stiff, and putrescent, and in a short time is resolved into it's original elements.

895. Man, however, accustomed to complain of the shortness of life, must be accounted long-lived when compared with other animals. Although this depends greatly on the original and congenital structure and constitution of the body, subjects not yet well understood, it may be also much promoted by the softer texture of the whole system, acquiring rigidity more slowly, continuing long to grow, and being late of attaining it's just stature.

896. It is likely that persons of a softer and laxer frame, provided they are healthy, live longer, and decay more slowly than those of greater firmness and strength; of this there are numerous instances: but there will still be occasion for a great many more, before this opinion can be admitted as established. It is, nevertheless, sufficiently evident, that old women, provided they get happily over the period when the catamenia terminate, live longer, and enjoy better health than aged men, and enjoy their mental powers more unimpaired; for it seems probable, that the dotage and the death incident to old age, are to be accounted for nearly in the same way (303.).

897. It is also abundantly evident, that the hard and incessant labour, by which a great part of mankind provide for themselves and families, though it preserve from many diseases, hastens old age, and of course a premature death. For men of rank and wealth, though debilitated by luxury and indolence, and often broken by many diseases, yet decay more slowly, and therefore live

longer than the needy artificers and peasants, whose narrow circumstances had taught them temperance and obliged them to labour.

898. The duration of human life since the deluge of Noah, seems to have been nearly the same in every part of the world. The instances are very rare of men who have completed a century, and the memory of man can scarcely furnish one or two examples of life protracted to an hundred and fifty years.

899. Some have a prerogative of longevity from nature itself, and from the original and congenital structure of the body, this being often hereditary and almost uniform in certain families. Others, feeble, and diseased by nature, or broken down by intemperance and an improper mode of life, have, by incessant attention, solicitude, and temperance, in many instances, acquired a new and better constitution, and have sometimes protracted life beyond the usual limits: of this Carnaro affords a signal instance and document.

900. The mind also, when cheerful, well governed, and gently excited by moderate and agreeable affections, neither worn out with too intense studies, nor distracted with oppressive cares, or harassing broils, seems to contribute not a little to longevity.

901. Although it is not credible that ever a remedy will be found, which can recal past youth, yet it seems likely enough, that some remedies may delay old age, and alleviate it's disorders, render life more pleasant, and perhaps prolong it a little; such as a diet sufficiently nutritive and easy of digestion, gentle exercise, generous liquor in moderation, some laxative medicines, above all a mild air, and sometimes the bath. Such diet and regimen nourishes the body without loading it, agreeably excites and supports the nervous system, assists the now languishing circulation, promotes the secretions, and gives greater softness, irritability, and sensibility to all the solid parts.

902. The stature also of men, like the duration of life, seems to have been nearly the same in all times and places, except in some very cold regions, which are

inhabited by another race of men, of lower stature. There is little certainty as yet concerning the giants of Patagonia, but there is no doubt that some individuals so far exceed the ordinary stature of men, that they are not undeserving the appellation of giants; but these are seldom observed to be well formed, and often feeble, dull, and unfitted for the various exercises and labours of the body. Farther, it may be demonstrated from mathematical principles, that a giant who should far exceed the usual stature of men, provided he were composed of the same materials as other men, would be utterly unwieldy, and could with difficulty drag his own body.

903. Dwarfs are likewise to be met with sometimes, who have scarcely reached the half, or even the third part of the proper stature: but these are in general deformed, often hump-backed, or furnished with a large head, are rarely prolific, and would never produce a nation of dwarfs. Some disease seems for the most part to be the cause, why such dwarfs do not grow in the usual manner, or perhaps decrease in size after they had grown a little.

904. There is, however, a considerable diversity of stature among different nations, and still more between different individuals, so that it may vary a foot or more between persons well shaped; yet the power and strength of body has not much dependence on the size. In some families, a tall stature is observed to be perpetuated almost without interruption; it must therefore often depend on the original and hereditary structure and constitution. On the whole, men are considerably taller than women, and of a very different shape. Other animals increase or diminish much in size, in the course of a few generations, according to the abundant or deficient supply of food. Man too experiences somewhat of the same kind, though not to the same extent as quadrupeds.

905. At first view, it will perhaps appear absurd, to suppose that the changes which the body undergoes at various ages, are the causes of diseases, especially as almost all animals, and many of the human race, enjoy

good health all the time, and health, in the same manner as the looks, ought to be different in the child from what it is in the vigour of life, or in old age.

906. But it is nevertheless certain, that very many diseases make their attack only at certain periods of life (51.), and depend much on the state of the body, declining somewhat from complete perfection of health, and becoming disposed to certain diseases: so that while years glide on, and the body undergoes different changes, the former tendency to certain diseases, being corrected or entirely destroyed, the person either enjoys good health, or is attacked by new diseases, contrary to the former.

907. It would be very difficult to point out all the circumstances, which, in the different periods of life, render the body liable to so many different diseases. It will be sufficient to mention, that those changes, and therefore the diseases which proceed from them, are conveniently classed under certain heads; namely, such as relate to the state of the whole frame (75, 94.);—of the solid parts, as too soft, or too firm;—to the state of the living solids (109, &c.), which may have their irritability or sensibility, their debility or power, either in excess or defect (370, &c.);—to the state of the circulation, as free or impeded, languid or violent, equable or irregular (443, &c.);—to the state of the secretions and excretions, as copious, deficient, or impeded (707, &c.);—and in a word, to the state of certain parts, which are evolved at a particular period, act for some time, and at length cease to act (758, &c.). The condition also of the fluids, which vary much in quantity, density, and acrimony, seems to contribute not a little to the various diseases of particular periods of life (516, &c.).

908. Thus children, whose solid parts are all very soft and feeble, whose nervous system is very irritable, the distribution of whose blood is very free, and their secretions and excretions very copious, frequently become deformed, are often afflicted with hernia of various kinds, with prolapsus, scrofula, or rickets, and are

often affected with convulsions or feverish complaints, from very slight causes: but they seldom suffer from severe fever, violent inflammation, haemorrhage, phthisis, palsy, gout, rheumatism, or dropsy, unless that of the head, which often proceeds from a scrofulous constitution, or a determination of blood towards the head.

909. Children also bear the loss of blood ill, but lose the thinner fluids with ease; they also do not easily bear want of food, and are speedily reduced during sickness, but recover quickly, and grow full again. They are easily affected, composed, stimulated, or purged, by medicines of every kind, even the slightest. But in their delicate bodies, there is an astonishing resistance to disease, and they often recover beyond all expectation, being much more tenacious of life than adults.

910. In the several stages of youth and manhood, persons becoming firmer and stronger than children, and less irritable, acquire for the most part an immunity from infantile diseases, and frequently become liable to others. For their growth having terminated, they become too full of blood, which is usually accumulated in the arteries (644, 5.) in a greater proportion than in the veins, and often spontaneously bursts from those parts which do not admit of farther distention (861.), as, in the first place, from the nostrils, then from the lungs, often with great danger of phthisis. Young men likewise become obnoxious to severe fevers and inflammation, partly from that superabundance of blood, and partly from the increased vigour of the whole body. Girls also acquire a peculiar mobility of constitution, scarcely observable at any previous period, perhaps depending in some degree on the state of the uterine system, by which they become prone to hysteria.

911. At the manly age, health is commonly in it's best and firmest state; because then all the parts of the body have now attained their due proportion, shape, and vigour; and neither the whole frame, nor any particular part has acquired too much rigidity; the nervous energy is not defective, nor the motion of the fluids

languid; and thus men are freed from the diseases of infancy and youth, and not yet become obnoxious to those of old age.

912. But in fact, that stationary condition of the body, more strictly denominated it's status, has no existence: for no sooner has it reached perfection, than immediately, though in many cases slowly, it begins to waste, and indeed by the very same means which had formerly conducted it to perfection (12, 19.).

913. In the first place, as those parts which endure most pressure become more rigid, the arteries speedily become hard and strong, are gradually constricted, and at length equal or exceed the veins in strength and firmness (444, 5.), whence more than their due quantity of blood is collected in the veins, especially in those parts where it's motion is more languid, and the veins of which are destitute of valves, and derive little assistance from the motion of the muscles. Thus in advanced life, a great quantity of blood is often collected in the abdomen (420.) and in the head (421.); whence are haemorrhoids, obstructions of the bowels, and sometimes dropsy, palsy, or apoplexy.

914. Disorders of this kind, depending on the state of the veins and arteries, take place more frequently, because many aged people become plethoric; namely, those who enjoy good health, digest well, and indulge in the pleasures of the table; who take but little exercise, and perspire sparingly; because many of the vessels and pores are nearly closed.

915. But independent of any superabundance, irregular congestions, or distributions of blood, by the failure of the nervous power, and languor of the circulation, old people become obnoxious to palsy, to dropsy of various kinds, obstructions, and cancer (751, &c.). Owing likewise to the same causes, the sight is impaired, the hearing becomes dull, and at last all the senses fail.

916. Farther, the greater part of old people are afflicted with numberless disorders of the urinary organs (737, &c.), perhaps bearing them long without great

inconvenience or danger, but as the diseases are continually aggravated, and commonly incurable, they come at last to be attended with their own peculiar dangers.

917. There are other diseases to which old people are more liable than young, as the gout, calculus, &c., the reason of which is rather more obscure, since they are not peculiar to old people, depend greatly on the original and congenital structure of the body, and are often joined with other diseases, especially of the stomach.

918. In fine, it is not unlikely that there is some fault long latent, perhaps not suspected (49.), which is only then ready to appear, when all the powers having failed, the functions are impeded, and the disorder chiefly attacks the parts now enfeebled and diseased (363.). This seems to be the reason why many hereditary diseases, seldom observed in early life, or even in the stationary period, break out at last in old age.

CHAP. XXIII.

On the varieties of constitution.

919. Good health is not precisely the same in all persons; for every one has his peculiar constitution, just as he has his own features and shape. Such varieties justly claim the attention of the practitioner, because they are often observed between persons of the same age and place, to such an extent, and of such a character, that different persons are afflicted with diseases of different kinds; what is beneficial to some, may be very noxious to others; nor indeed do the same remedies, diet, or mode of life, agree with all. It is therefore a matter of no small importance, to have a thorough knowledge of the constitution of every patient.

920. But experience alone furnishes this sort of knowledge: certain differences, however, such as more frequently occur, have from the earliest times been observed, and distinguished by certain names: these varieties are called Temperaments, as if they drew their origin from a mixture, and as it were, a tempering of the various elements which compose the human body; and of these, four are commonly enumerated as primary temperaments, the sanguine, melancholic, choleric, and phlegmatic. The propriety of the appellations is not very evident, nor is it of much moment what term we use to express any object, provided that term be well defined; and it would doubtless be wrong to change names which are in every person's mouth, and well understood.

921. Those medical men, in every period, have indeed been very much mistaken, who have endeavoured to account for the variety of temperaments, and refer

every one to the superabundance of some one humour or element in the body, as of water, blood, bile, black bile, coagulable lymph, or earth. Nor are the ancients the only persons who have observed well, and described with fidelity, though they reasoned ill from the facts. At least it is somewhat to know those descriptions and observations, so far as they serve the purpose of the practitioner, however obscure the reason of them may be.

922. The sanguine temperament, is distinguished by a fuller habit of body, the structure rather soft; skin delicate, thin, soft, and warm, marked with large conspicuous and blue veins; fine complexion; hair often red or yellow, sometimes a little brown. Persons endued with such a constitution, are observed to be possessed of more than usual sensibility and irritability, have the pulse more frequent than usual, a very free circulation, secretions and excretions, in general copious, seldom obstructed, the mind for the most part happy and cheerful, sometimes gay; for varieties of mind as well as of body, often depend on temperament.

923. This temperament is peculiarly obnoxious to a superabundance and violent circulation of the blood; to fevers, and inflammatory diseases; rheumatism, quinsy, &c. and to diseases of the nervous system, especially hysteria. Temperance in eating and drinking, and frequent exercise, agree well with this temperament, also occasional evacuations, which it commonly bears well.

924. The melancholic temperament seems to be nearly the opposite of the former, of a firmer fabric, often lean, skin thick, dark and hairy, veins large; hair, eyebrows, and eyes black, of a dark complexion. Persons of this temperament commonly have a slow pulse, and languid circulation; the blood itself, it is said, thicker than usual; the secretions and excretions sparing, sometimes deficient; little sensibility or irritability of the nervous system; the mind serious, often sad, addicted to meditation; not easily roused, but, when

once roused, very tenacious of passion; in business indefatigable; in study most acute; in love most fervent and faithful; often possessing a genius for poetry, sometimes prone to melancholy and insanity (292, &c.) They suffer greatly from an idle and sedentary life, and from stimulating and heating remedies; they have often a bad digestion and diseased stomach, and are obnoxious to hypochondria, which is more rarely observed in other constitutions. They are said to be more liable than other people to obstruction of the abdominal viscera.

925. The choleric temperament occupies nearly the intermediate place between these two, being denoted by more softness and irritability of the system; by a skin less dark and hairy; by a more florid complexion; a more frequent and vigorous pulse; more abundant secretions; a mind more irritable, and, as is affirmed, especially more prone to anger than in the melancholic temperament.

926. The phlegmatic temperament is marked by a lax and feeble structure of body, in many cases attended with obesity; by a pale countenance, skin smooth without hairs, the hair white, pulse slow and feeble, and blood-vessels small; by fluids, as is alleged, unusually watery, bland, and languid in their motion; by digestion, secretion or excretion, slow, and sometimes obstructed; and by a mind dull, torpid, sometimes drowsy, not easily roused, very prone to fear and avarice. Exercise, and sometimes stimulating medicines, agree well with persons of such a constitution; nor are they greatly injured by now and then a moderate use of wine.

927. All these temperaments are mingled in various modes and proportions: as for instance the phlegmatic with the sanguine or melancholic. We daily meet with instances of such conjunctions.

928. Some also describe another, which they call the nervous temperament, and which is very properly so denominated, according to that meaning of the word which is now admitted among medical men, and indeed received into common use; as marked by a striking debility and irritability of the nervous system. Such a

state of that system may be induced in all the temperaments, but more readily in the sanguine, either pure or compounded with the phlegmatic; by an indolent and sedentary mode of life, by plethora, heat, and other causes already enumerated (370, &c.); hence it is very frequent among the rich, indolent, and luxurious; it was almost unknown to the ancients, at least it was much more rarely observed among them, but has been now too well known to the moderns for the last hundred years.

929. This temperament is liable to many diseases of the nervous system, as hysteria, dyspepsia, &c. It is ill calculated for bearing any evacuation, especially loss of blood, and the most of the more powerful medicines, and often requires strengthening remedies.

930. The constitution of the two sexes is commonly quite different from each other, women having more of the sanguine, or, in some instances, of the phlegmatic temperament; are softer, more delicate and feeble than men; have greater irritability both of mind and body; and are more liable to diseases of the nervous system, but less so to inflammatory diseases. In respect of constitution, therefore, women differ from men in a similar manner, though not to the same extent that children differ from adults (908, &c.)

931. Neither has any one the same temperament quite steady through the different stages of life. For all are changed by time, and sometimes one passes into another. Thus in early life the sanguine is observed very pure; in middle age it verges toward the choleric; and, in the decline of life, approaches to the melancholic; and, on the contrary, the melancholic commonly participates of the sanguine in early life.

932. Besides, the body is not a little affected by the climate in which we live, and the mode of life which we use, and thus persons become obnoxious to some diseases, and quite out of danger of others.

933. Although there is perhaps no region utterly uninhabitable by mankind, yet it is reasonable to suppose that some are superior to others, and produce men

the most perfect in mind and body. Temperate regions, with a climate intermediate between excess of heat and cold, seem to possess this excellence. Many considerations forbid us to ascribe the varieties among nations to the effects of climate alone, seeing they are greatly affected by other causes, both natural and moral. Still there are not a few such varieties which manifestly depend on the climate.

934. Thus, in warm regions, the body is relaxed and debilitated; the nervous system becomes very irritable; the circulation free; the secretions, particularly the cutaneous exhalation, copious, and the fluids, for the most part, thinner, and (according to the common opinion of medical men) more disposed to putrescence than in temperate or cold regions. Therefore, the inhabitants of warm regions, for the most part, for there are some exceptions, are indolent, unwarlike, and indisposed or unfitted for all kinds of labour, being addicted to pleasures, especially to venery; they are prone to all the passions, lively, but unsteady, possessing little vigour of mind; sparing in their food, which they commonly prepare from vegetables, and having little occasion for generous liquors, they seldom abuse them.

935. They are very liable to diseases of the nervous system, or those of the putrid or bilious kind; they are more rarely affected with inflammation: of course, when sick, they stand much in need of such medicines as may correct putrescency or bile, and can ill bear evacuations, particularly blood-letting.

936. On the contrary, the inhabitants of cold countries have firmer and more vigorous bodies; the nervous system is less irritable; the fluids thicker, and their motion more languid; perspiration more sparing; and they often become corpulent; they use much stronger food, especially animal food, with wine and other generous liquors. They are more robust than the inhabitants of warmer regions, more courageous, better fitted for all labours or for war, endued with less vivacity, but with

greater vigour of mind, also less addicted to women, but not less prolific.

937. They are liable to continued fevers and inflammations; not so much exposed to nervous disorders, unless their native vigour be broken down by a bad mode of life; nor are they so much disposed to putrid or bilious diseases. While under disease they commonly require more powerful medicines, and bear easily the loss of blood.

938. Farther, similar varieties, though not to such an extent, are observed between the different seasons of the year, where it happens that some diseases prevail more at one season, and others at a different time; and the same diseases usually require a different treatment in the spring and in the autumn.

939. Considerable varieties are owing to the kind of food. Thus, the persons who live chiefly on animal food, and indulge in more delicate dishes and generous liquors, are usually more robust than those who drink water and live on a vegetable diet; but they are often less healthy, and more disposed to plethora, inflammations, and putrescency.

940. The mode of life, especially as bearing on exercise or indolence, is of great importance in preserving people from some diseases, and disposing them to others. Thus exercise, if it is not to excess, invigorates the body, helps digestion, promotes the secretions and excretions, quickens the circulation, and prevents excessive congestions of blood; and, of course, either prevents many diseases, or expels those which have already come on, and are in operation.

941. Indolence again relaxes the body, debilitates and renders it irritable, makes the circulation languid, generally diminishes the secretions and excretions, produces plethora and obesity, and therefore paves the way to a great number of diseases, as hysteria, dyspepsia, gout, haemorrhage, apoplexy, palsy, obstructions, or dropsy.

942. But violent exercise, though it communicate

firmness, strength, and excitement to the body, yet renders it more disposed to some diseases, partly perhaps through the greater density or acrimony of the fluids, but still more through the great power and strength of the solid parts, and of course the increased force of circulating fluids; whence it happens, that certain fevers and inflammations attack one with greater facility and violence. Again, severe and incessant labour, by a very different process, exhausts, debilitates, and hardens the body, and consequently induces premature old age (897.).

943. Mental regimen too, is no less conducive to health than to longevity (900.). Violent passions, whether exhilarating or depressing, and anxious cares, in different ways, are injurious to health (345, 46.): also, too intense study, or without the requisite intermissions, injures both body and mind, particularly the nervous system, the stomach, and the head.—But the injury commonly supposed to proceed from study, would, for the most part, be more justly attributed to that improper mode of life, which many literary persons adopt, who generally neglect exercise: and it is no way difficult to explain, why a sedentary life does hurt (941.).

944. Farther, though many grow old in arms, many in business, many also in idleness, luxury, and pleasures, and enjoy good health all the time, yet the examples of the greater part of philosophers demonstrate, that a tranquil, temperate, and contemplative life, conduces very much to health, and consequently to long life; seeing it is free from not a few dangers and causes of disease to which active life is exposed.

945. Lastly, it must always be borne in mind, that man is so versatile, that of all animals, he alone accommodates himself to all climates however different, and to the most opposite modes of life, and, indeed, seems born for them all. In nearly the same way he accommodates himself to very different kinds of food; and, in short, so accustoms himself to the most powerful causes of disease, and to matters not undeservedly accounted poi-

sons, that he not only suffers little injury from them, but on many occasions, whether in health, in sickness, or in a state of convalescence, he cannot forego the use of them without difficulty, or even danger.

END OF PART FIRST,

COMPRISING

PHYSIOLOGY AND PATHOLOGY.

A
CONSPECTUS
OR
BRIEF VIEW
OF THE
THEORY OF MEDICINE.

PART II.

CHAP. XXIV.

Of the method of cure; of the nature of remedies; of the indications of cure, directed to the complete cure, the mitigation, or the prevention of diseases.

946. THE innumerable remedies which either provident nature hath furnished, or human industry prepared, however widely differing among themselves, not only in other more evident properties, but especially in their medicinal powers, may nevertheless be conveniently referred to a few heads, according to their general and manifest effects, and their simplest qualities (71, 4.), by which they act on the human body.

947. For there can be no plan or arrangement, or any real or profitable knowledge of the qualities of medicines, if remedies are named and classed according to the denominations formerly adopted by practitioners, and still in use among the mass of the people, from their occult qualities and properties, from their uses in curing various complicated diseases, or from the

various organs of the body to which they appeared to be most useful or appropriate. Physicians are now tired and ashamed of prating concerning remedies, specific, alexipharmic, febrifuge, cephalic, ophthalmic, cordial, stomachic, restorative; or anti-phthisic, anti-hydropic, or anti-paralytic; unless they can, in some measure, point out and explain their nature, and the mode in which they produce their beneficial effects.

948. Nor indeed is it sufficient for a medical man to know, that certain remedies are useful in certain diseases, unless at the same time he understand by what means they produce this good effect, and which of the simple diseases, constituting the compound one, they are chiefly suited to counteract: otherwise, being at a loss as to the use and administration of the best remedies, he will be incapable of accommodating his prescriptions to the different patients, as they are variously affected; of selecting the suitable remedies; or of giving, in any one instance, the most suitable with safety and efficacy. For, in employing remedies, it must always be recollected, that not only the name and general nature of the disease are to be taken into account, but attention must be paid to very minute circumstances, which either refer to the origin and causes of the disease, with the variety and conjunction of it's symptoms, or to the state, the strength, and perhaps idiosyncrasy of the patient.

949. Besides, if remedies should be classed according to the parts of the body which they benefit, or the compound diseases which they seem to cure, it is evident that inextricable confusion would be introduced into the materia medica, and many remedies would be comprehended under various and widely differing heads; because, according to the various diseases which infest the body, their various causes, with the states and constitutions of the patients, the same thing would now relieve the head, now the belly; would at one time prove effectual against fever, at another against palsy, and at another against dropsy; in one case relieve or cure ophthalmia, in another gout, in a third, diarrhoea.

950. Remedies ought therefore to be denominated

and classed according to their most constant and simple effects. Hence also it follows, that the better the powers of medicines are discerned and understood, and the more complete and accurate are the theory and practice of medicine, the more will the materia medica be simplified, and the fewer names and classes of remedies will be talked of by practitioners. For though this department of medicine has of late been very much cultivated, and, by rejecting many classes of medicines the celebrated monuments of the ignorance and credulity of our ancestors, has been reduced into a perspicuous and elegant form, it is evident, that it would sustain no loss by the want of some classes of remedies which are yet celebrated by physicians, should the names given to the powers of remedies be derived only from their most simple effects.

951. Farther, the particular remedies, which are comprehended under every name or general title, may be classed and distinguished in a similar manner, so far as they differ among themselves; whether they differ only in the magnitude or degrees of the same general effect; or, besides the general and common effect, some of them possess other qualities peculiar to themselves.

952. A remedy, therefore, is every aid which can effect a salutary change on the human body.

953. Such aids are usually reduced to three general heads: surgery, medicine, and mode of life, or regimen, as it is termed; under the last of which are comprehended, not only the regulation of diet, and of the various functions of the body, so far as under our direction, but mental regimen also.

954. The knowledge of the qualities of remedies, and of the manner in which they operate to the benefit of the human body, is usually expressed by the general term Therapeutics.

955. Having already explained, as far as practicable, the functions of the healthy body, and the symptoms and causes of the more simple diseases, our business is, in the next place, to point out, according to the institutes of rational medicine (72.), in what manner remedies are

so adapted to diseases, that by correcting or removing their causes, the patients may again enjoy entire health.

956. A physician, imbued with the principles of rational medicine, having thoroughly examined the state of the patient, both as to the symptoms of disease, and, at the same time, as to matters not morbid, forms a judgment of what is necessary to be done: for instance, what is to be changed in the affected body, that, by the removal of the cause of the whole disease, or of any part or symptom of it, the disease may either be completely cured, or at least be rendered more mild, more safe, or more supportable.

957. Such a judgment or decision is called the indication of cure, or curatory indication; the circumstance, whatever it be in the patient, that suggests that judgment to the practitioner, is called the Indicans, or indicating circumstance; the change too, which he judges necessary to be effected, is the Indicatum: that change is at last effected, and the indication of cure fulfilled by means of remedies.

958. It has, indeed, been matter of much dispute among physicians, whence indications of cure should be drawn. Were medical science altogether perfect, and the proximate causes of all diseases known, according to the notion of the proximate cause of disease which is commonly received among medical men (46, 7.), and were the remedies suitable for effecting the desired change known and in readiness, then it would be quite evident, that, laying aside the consideration of the remoter causes, the indications of cure ought, in every disease, to be assumed from the proximate cause; and that respect should be had to it alone, as that which, being removed, the whole train of diseased symptoms would be removed at the same time. But so far is the healing art from having hitherto attained such perfection, that it is seldom practicable to accommodate the remedies to the proximate cause of disease, nor is it proper to neglect other circumstances, either the more remote causes, or the present symptoms of disease.

959. There are, however, four things on which ra-

tional medicine much depends, and whence, by consent of all medical men, the indications of cure may be properly deduced: in the first place, the most remote causes which only render the body obnoxious to disease; the remote exciting causes, which being applied to the body, already become thus liable, induce the disease; the proximate cause, wherever it can be detected and defined, the effect of the concurrence of the former, which constitutes the disease; and lastly, the several symptoms and signs of disease, and various conditions of the patient, whether present, past, or even future, if, at any time, by certain present symptoms, possibly slight enough, we are apprised of other severer ones approaching.

960. But some authors of no mean reputation, contend that the indications of cure are frequently to be deduced from the experience of things profitable or hurtful, and from the powers or efforts of nature herself, in other cases struggling with similar diseases (65, &c.); and, in some cases, also from the various appetites, or unusual longings of the patients, by which, as by a certain instinct, they are invited and led to matters of a salutary description, and diverted from those which are pernicious (646.).

961. Others again deny that the indications of cure are rightly deduced from these things, or that such a method of practice deserves the name of rational medicine. The term is certainly not worthy of a dispute; nor can there be any controversy about the thing itself; for no sound person will deny, that it belongs to a good and wise physician, whether you call him rational or not, to pay the utmost attention to the efforts of nature, the longings of the patient, and the experience of what is beneficial or hurtful; that he should often learn from these, and be directed by them in exercising his skill.

962. Medical men indeed have often disputed in what cases the efforts of nature are to be assisted and promoted, and in what cases they are to be allayed and restrained. And indeed it is not possible to lay down any certain and fixed rules on that subject; because

every process of cure ought to be accommodated to the peculiar condition of every patient. It will therefore be the part of the practitioner to judge, in particular cases of disease, what is most beneficial to the patient; to second the efforts of nature, if they appear to be safe and useful; otherwise, to hold them for diseases, or at least the symptoms of disease, to be either moderated by his skill, or entirely stopped.

963. For a similar reason, the discerning practitioner will judge of the utility or danger of the various appetites which are excited in diseases, and when, and to what extent it may be convenient to indulge them. He will view this kind of efforts or instincts in much the same light as remedies prepared by art, and cautiously and steadily consider what the disease requires, what the condition of the patient will admit of, and above all things, what his strength can or cannot bear.

964. Farther, all good practitioners will always have recourse to those remedies which certain experience has shewn to be beneficial, whether the mode of their operation be understood or not; and will abstain from those which appear, from the same experience, to be either noxious or inefficient. For medical science is just so far a benefit as it conducts us to good remedies, and an eligible method of cure; and, indeed, neither the just rules of philosophical research, nor even common sense will admit of confidence in any reasoning, however specious, which is contradicted by experience.

965. As it frequently happens, that in the same patient, a great number of morbid conditions may exist at once, which differ widely among themselves, and various symptoms of disease be urgent at the same time, some of which may produce more uneasiness than the primary disease itself, or perhaps be attended with greater danger, it is quite evident, that in some cases, many indications of cure may present themselves simultaneously (956, &c.), which the practitioner is bound to fulfil, either all at once, or in succession, as the case requires, or as he shall find practicable.

966. In some instances, various circumstances found

concurring in the same patient, may require the same remedies: or, as authors love to speak, indicate the same thing. But circumstances are often found so very different, that they require remedies, not only different, but opposed to each other. Hence, arise Co-indicantia, and Contra-indicantia, about which physicians have had so much discussion.

967. The former of these may be attended to without hesitation; the latter are often involved in very great, or almost inextricable difficulties. But that plain and most useful rule is laid down for it, than which there can be no precept more simple or evident, to satisfy first the greater and more urgent necessity, postponing attention to the lesser; for the more pressing danger being removed, or so far alleviated, time is obtained to attend to slighter disorders; or these may perhaps be removed by the powers of nature alone, which, through the relief obtained, becomes more adequate to her own work. It deserves notice, however, that the greater number of difficulties of that kind with which practitioners have been entangled, are imaginary, proceeding from the consideration of the symptoms only of disease, without due attention to their causes.

968. It cannot indeed escape the notice of any one who pays attention to the causes and symptoms of disease, that many very different diseases originate in the same cause, suppose a simple disease or disorder inherent in the system. Nor ought this to be met with a denial, or with ridicule, as if it were an imputation of different and opposite effects to the same cause. For, besides that, the condition of the body varies greatly, and is scarcely altogether the same in different persons, or even in the same persons at different times; and thus various affections proceed from the same cause; so in general, every one of those affections or morbid symptoms, may be accounted another morbid cause, whence, as from a new root, spring new diseases, new disorders, new symptoms of disease, in a continued series.

969. In such a state then, it is quite plain, that from

the view of every symptom of a compound disease, a new indication of cure will arise; and, of course, there will be occasion for as many remedies for the cure of any one disease, as there are preternatural appearances observed in the several patients. For a like reason also, not only medicines almost innumerable must be swallowed by the patients at the same time, or at very short intervals, but these will also be of a very different, perhaps of a quite opposite nature; so that if the particular remedies, so opposite among themselves, operate with any efficacy, they must of necessity mutually disturb and impede one another, not without serious inconvenience, or perhaps danger to the patient.

970. Farther, both reason dictates, and manifold experience teaches, that little progress is made in the cure of diseases by those who adopt such a mode of practice, and who neglect the origin and cause of the disease, while they are wholly occupied in alleviating the particular symptoms. For, on many occasions, the most troublesome symptoms of a disease cannot be removed or relieved by any remedies, unless the cause of that disease be first removed. Or if, by mere accident, it's uneasiness be suspended by some powerful remedies, which abolish or overpower the feeling of it, yet the danger is far from being removed with this uneasy feeling.

971. For the most part, indeed, when the symptoms are mitigated, in whole or in part, the whole disease is at the same time relieved, and becomes not only milder, but safer too, and easier to cure; perhaps, in some cases, it may also be completely cured by the powers of nature: that this, however, is not uniformly the case, is manifest from the most abundant experience; and there is commonly no greater or more frequent difficulty felt in the healing art, than how the practitioner is to know when, and how far the more troublesome symptoms are to be mitigated, while postponing the general cure of the disorder, which is only to be accomplished by removing it's causes.

972. Therefore, from the observations already made, it is easy to understand the difference between the cu-

ratory and palliative indications of medical writers, the latter of which are directed to the mitigation, and the former to the cure of disease. It will also be evident, why the indications of either description, especially of the last mentioned, may sometimes serve the purpose of the other. Farther, cases too frequently occur in which there is no room for a complete cure, whether owing to the incurable nature of the disease, or to the imperfect state of medical science, which furnishes no suitable and effectual remedies against it. And, in fact, in all diseases, when come to extremity, and symptoms of approaching death leave no hope of cure, something still remains for the skilful practitioner to do; for it will be an object, in such a wretched and desperate state, to allay the complaints which he cannot remove, and, at least, attempt to afford the dying person an easy departure, though he can neither preserve nor farther prolong his life.

973. In fine, medical men have been pleased to engage in another work, and that neither trifling nor unprofitable, and by their skill, not only to heal diseases already present, if admitting of cure, or at least to alleviate them where no hope of cure is left,—but also to protect health, and so guard against diseases, that whoever should duly observe their directions, should never be sick, but living always in the enjoyment of good health, might reach with ease the extreme limit of human life. Many precepts, indeed, some of them good, are usually given by medical men, the knowledge of which may be extremely beneficial on many occasions, though it can by no means be admitted that they are all good, or that the proposal itself of preserving health is of so easy execution as they have apprehended. And truly they have not made great progress hitherto who have attempted to accommodate their mode of life to medical rule; and still less those who have endeavoured to confirm and preserve good health by means of remedies.

974. But all the care of preserving health, and all the hope and confidence of preventing disease, turns on

this one thing: namely, the guarding as far as possible against the remote causes of disease, both predisposing and exciting, that the latter may with the utmost diligence be avoided, and the former corrected; for, without the concurrence of both, there can be no disease (42.). Now we may often defend or deliver persons from one or both kinds of morbid causes, and thus sometimes preserve even the very infirm and valetudinary for a long time in health. Sometimes there is inherent in the constitution a tendency to certain diseases which cannot be eradicated or corrected by any means: in this state, prevention is accomplished by avoiding external injury. Sometimes, however, the difficulty presses from another quarter, when these extraneous dangers, through their frequency and constancy, and the unsuitable mode of living which many are obliged to adopt, can with difficulty be entirely avoided: then the whole power must be exerted to correct and diminish, or, if practicable, to eradicate entirely that tendency. Nor is it difficult to conceive, that the same remedies, given on the same plan, which are useful against diseases already formed, should be serviceable for this purpose too. For such tendency to disease may be accounted a slighter variety of it (43.), differing in degree only, not in kind, and therefore to be removed by the same means and remedies as the more decided disease.

CHAP. XXV.

Of the diet of the sick.

975. Before proceeding to enumerate the various kinds of medicines, and to explain their qualities and mode of administration, a subject truly of no slight moment presents itself for our consideration; namely, what kind of diet suits the sick, and by what means it may be varied as circumstances require, and accommodated to the different diseases under which persons suffer.

976. What confidence ancient physicians placed in this, no person can be ignorant who has even slightly looked into their writings. For with such attention and diligence did they cultivate this department of medicine, that it is quite evident, the greater part of them trusted much more to diet than to remedies. A medical sect also flourished for some time among the ancients, who were of opinion, that all diseases are cured by the same things which we daily use in health, but only changed according to the condition of the body, and duly accommodated to the nature and causes of disease. They were also fully apprised, by means of the gymnasia, and the athletics educated in them, what influence the diet and whole mode of living has upon the human body. Hence there have been handed down to us from the ancients, precepts without number, with a shew of the greatest accuracy, concerning the cure of almost every particular disease, and the preservation of good health. Some of these are excellent and suitable, being dictated by extensive experience and sound reasoning; but the far greater number are found to be futile, trifling, and utterly absurd, suggested to them

by the prejudices of long established habit; by a desultory, inaccurate, ill understood, or mere imaginary experience; or, in a word, by mistaken views of the nature and causes of diseases, and the effects of the various kinds of diet.

977. While these hypotheses of the ancients were, after the lapse of many ages, scarcely or not at all abolished, new errors, and of almost equal magnitude were introduced, derived generally from the opinion of the medical chemists of the preceding age, and accommodated, according to the custom of medical men, to the various conjectures which then and more lately obtained concerning the causes of disease. Thus, while they believed that almost every disease consisted in some depraved condition of the humours, their directions concerning the diet of the sick turned chiefly on this hinge, that the meat and drink taken, should be of a nature contrary to that condition of the fluids in which they believed the disease consisted, and which they imagined would be corrected by the mixture and chemical power of the aliments.

978. But whatever was the extent of the error of ancient or modern medical writers on this subject, no man who has even the smallest acquaintance with the human body, and the diseases to which it is subject, ever entertained a doubt that a great and very decided guard against bad health, in some cases perhaps the only defence, lies in a suitable diet: in the first place, because as already stated (55, 642, 844, &c.) many and indeed severe diseases, evidently originate in the nature of the diet which people use, whether it has been taken in improper quantity or quality, or both; and in this state, to remove the evil effect, it's cause must first be removed. Again, although the disease may have arisen from an entirely different cause, this attention to diet is necessary, because many sorts of aliments become pernicious in some diseases and salutary in others, according as these aliments in their own nature, either favour or counteract that morbid condition of the body in which the disorder chiefly consists, whether it have

it's seat chiefly in the fluids or in the solid parts; in fine, it is necessary, because in almost every disease, both acute and chronic, those very aliments, which are most excellent in their own nature, and to the person in good health most salutary, often become unsuitable, partly owing to the general weakness of the body, but no less to the special debility of the organs and powers which are subservient to digestion and excretion. In consequence of this weakness, whatever food is taken, is digested more feebly and slowly, perhaps is never converted into suitable nourishment, and thus, instead of refreshing the body, it greatly injures it, and especially oppresses the stomach and intestines, in such a manner that it is with difficulty they can discharge their functions afterward. Such being the state of things, it will occasion no surprise, if to the first symptoms of disease now aggravated, there be an accession of new and severer disorders; nor indeed is there room to doubt, that the best known and safest aliments, and those of daily use, when unseasonably granted to the sick, have often had the very worst effects, in some cases terminating in death.

979. It will therefore be evident, that great care and attention must be bestowed on the diet of the sick, and that the practitioner has often need of much skill to know what aliments are to be allowed, and at what time. But since neither the limits nor design of this work either permit or require us to enlarge on the treatment of particular diseases, it shall suffice to give in this place, some advices and precepts as general as possible, concerning the diet suitable to two classes of diseases, the acute and the chronic. These two divisions while so different and almost opposite, and in some respects comprehending all diseases, will sufficiently illustrate the general doctrine concerning the management of diet, which every one will readily know how to accommodate to particular diseases, on an examination of their special characters.

980. In the greater number of acute diseases, such as fevers, and other affections of the same nature, there

is generally such a state of the natural appetites, that the patients, so far from desiring food, greatly loathe it, and in many cases can by no arguments or intreaties be induced so far to conquer this repugnance, as to take even a single mouthful of food, however delicate.

981. In this state then, it would certainly be absurd to prescribe much food of any kind to the sick; especially as it is both a dictate of reason, and manifest from abundant experience, that, either in health or sickness, particularly in fever, when food is taken in spite of natural repugnance or defective appetite, it is digested with difficulty; has little effect in nourishing or refreshing the body; does no good, but often much injury, by oppressing and irritating the stomach and intestines with much corrupted, acrid, and putrid matter. For in such diseases, there is extremely little nourishment absorbed from the aliments to be conveyed into the blood as usual, and of course in proportion to the quantity of food, there is much more feculent matter than in healthy persons, and that much corrupted; especially is this the case when there is constipation of the bowels, such as commonly happens; whence the heat is increased by the excessive stimulus applied to the body already preternaturally heated, weakness augmented, anxiety aggravated, headach, thirst, nausea, vomiting, gripes, and not unfrequently intractable diarrhoea induced; which are all very troublesome to the patient, agitate him in a most distressing manner, are in fact in their own nature noxious, and some of them very dangerous.

982. Food must therefore be given as sparingly as possible to persons confined to bed in acute diseases, and rather granted to those that ask it than imposed on the reluctant; because in this case, there is more danger in excess than in defect: for in such diseases, nature is content with the most slender food, is readily oppressed with what is more nourishing, and often requires almost nothing beyond suitable drink. However, food is not on these accounts to be entirely denied to persons under fever, even in the very beginning of the disease, especially if the patient have any appetite;

but still more is it proper to give a little suitable food after the disease has far advanced; for by that time there is a great prostration of strength, the body is wasted in a surprising manner, and the fluids often seem to acquire a very putrescent tendency. In this state, food is evidently necessary, and if properly digested, will prove the best of remedies; it will at the same time refresh and nourish the body, support the strength, and in the best manner possible correct the putrid tendency of the humours, if any be present.

983. With regard to the quality of the food which is allowed to persons confined by acute diseases, nature itself admonishes thus far, that it should consist of farinaceous or other vegetable matter, not of animal food. Very few cases are observed of feverish patients, who either desire, or can view without disgust, the flesh of animals, or food prepared from it, however delicate, while the same patients will sometimes devour with the greatest eagerness fruits, pulse, or even common bread.

984. Reason farther teaches, that in such diseases, a vegetable diet is far preferable to animal food. The latter, if properly digested, is commonly too nutritive, and if not digested, it is plain that it must do hurt: again, it excites and heats the body too much, induces or increases thirst, and often renders fever more intense: farther, it readily and spontaneously becomes putrescent, and perhaps hurries into putrescency the fluids of the body already tending to that state; in a word, it is more difficult and slow in it's solution and digestion in the stomach than vegetables, and of consequence remains longer in it. Farinaceous vegetables, again, are of easy solution, are digested in a short time, pass quickly from the stomach to the intestines, relax the bowels, moderately nourish the body, but neither overload nor fatten it; they cool rather than heat, allay thirst, moderate fever, and powerfully resist putrefaction.

985. Therefore all vegetables, or at least the most part of those which are in common use, ripe fruits, esculent roots, pot-herbs, pulse, and every species of

grain, as barley, oats, wheat, rice, &c. certain mucilaginous aliments derived from plants, as the gluten, from the root of the orchis, or that from the sago tree, cooked and prepared in a variety of ways, may be safely granted to those labouring under acute diseases. Nor is it a matter of small moment, that Nature profusely supplies so many suitable aliments, and that they may be so readily varied, since sick persons almost uniformly loathe every kind of food, however suitable or agreeable it is at first, when they have been a little accustomed to it, and prefer other food, or the same otherwise prepared.

986. Of the several species of food enumerated (985.), fruits and oleraceous vegetables afford the most slender aliment; pulse and roots, especially if they are farinaceous, like the potatoe, are somewhat richer; but grain is by far the richest of all vegetables, particularly wheat and rice, which are accounted much more nutritive than barley or oats. But among them all perhaps there is no sort of food more excellent in it's own nature or more accommodated to sick persons, than good fermented bread, nothing of easier solution or digestion, nothing which contains more nourishment, or is more generally relished by sick persons. Therefore, fermented bread, soft, but not too new, or prepared with water, and reduced to a thin and very soft mass, called panado, is suitable to feverish patients; or it may be toasted, when the patient's appetite requires some drier food, which is often the case, while nature itself admonishes us that food entirely fluid is not proper (620.).

987. But above all kinds of food, barley has, even from the most ancient times, been prescribed and celebrated in acute diseases, and by the father of medicine many instructions have been given concerning the proper cooking and preparation of it in various ways. Thus ptisan of various consistence, or barley water, as it is now usually denominated, is by practitioners prescribed in fevers, equally for food and drink. Farther, barley in substance, well boiled and softened, either

unmixed, or mixed with raisins, or a little sugar or wine, is a good and safe aliment in acute diseases.

988. Some preparations are also made of oats suitable enough to feverish patients. Oatmeal pottage is itself no bad food, but there is in more frequent use a very thin pottage or oat gruel, which serves the purpose of food and drink at the same time. Our countrymen too, especially the peasantry, are skilled in preparing an excellent food very suitable to persons in fever, from the bran or sheelings of oats, by pouring on it a large quantity of warm water, agitating and mixing it thoroughly; then after a few days, when the bran has subsided, they pour off the supernatant liquor, now inclining to be thick and acescent, and boil it till it acquire the consistency of pottage, or rather of a thin paste, very easy of digestion and slightly acid.

989. Esculent roots, pulse, and oleraceous vegetables, are more rarely given to persons in fever; nor do they seem to possess any peculiar advantage; besides, some of them are digested with considerable difficulty, and of course are corrupted and too long retained in the stomach and intestines. But there is nothing to hinder the greater part of them from being granted to the feverish patient at his own desire, or in case of the deficiency of more eligible food.

990. But mellow apples and all ripe fruits are in general freely allowed to patients in acute diseases, unless some unusual circumstance, as a violent affection of the stomach, or severe diarrhoea forbid the use of them; yet, even in this state, they are not always injurious, because in fevers, diarrhoea, or other affections of the belly, appear in many instances to proceed from putrescency, not from acidity; and in that case it is probable that every kind of fruits would prove beneficial rather than injurious.

991. Even animal food and the preparations of it, are not to be entirely withheld from persons in fever, especially toward the end of protracted fevers, when in many cases mere debility is more urgent and dangerous than the real symptoms of fever; in such circumstances

the strongest and most nutritive aliment which the patient can digest, may perhaps be necessary in order to support the bodily strength.

992. Farther, in this state patients sometimes acquire an appetite for such food, take it eagerly, and with manifest benefit; and many and very surprising instances are reported of patients, who, after all the resources of medicine had been tried in vain, and when the slender diet commonly prescribed seemed to be hurtful, have been completely cured of the disease under which they laboured, by a full meal of animal food, taken or rather devoured with greediness.

993. But we must not trust too much to cases of this kind; for, besides that such medical miracles are seldom without some suspicion, it is very probable that such acute diseases had been already cured by means entirely different, whether by the powers of nature alone, or by the aid of medicine, and that so strong a desire for animal food did not take place until the disorder was already relieved, and the patients had begun to feel the powers and benefits of returning health; so that such voracity ought to be accounted the symptom and effect rather than the cause of the decline of fever. Certainly no reasonable person would so far confide in such stories, however true they might be, as to prescribe a flesh dinner as a remedy for one in fever, while the patient loathes it, and feels complete disgust at every kind of food, even the most delicate.

994. The different kinds of flesh, and food prepared from them, are therefore always to be cautiously and sparingly administered to persons in febrile complaints; and are chiefly to be allowed when neither violent fever, great heat, immoderate thirst, or symptoms of much putrescency are present, but great debility from contracted disease, and long abstinence, is urgent, and the patient has an appetite for animal food. This last, indeed, will seldom happen, unless it is likely to prove beneficial; or if they should be induced, through delirium, or mere taedium of the diet commonly prescribed, to demand flesh meat, when this would be unsuitable to the nature

of the disease or state of the body, no sooner do they taste the very things which they so eagerly desired, than they almost instantly loathe them, and generally do not take so much as would injure the system.

995. As to the form in which such food is to be administered to feverish patients, that is chiefly to be attended to, that it be so cooked and prepared that it may be digested with the greatest ease, sit very light upon the stomach, and stimulate and heat the body as little as possible; on which account, pure and solid flesh meat, whether roasted or boiled, is more rarely allowed to patients in acute diseases, seeing the stomach and intestines are, through weakness, incapable of dissolving and digesting it; and the decoction or thin broth made from flesh meat, or jelly, to which a little wine or sugar, or lemon juice, is usually added, are more frequently prescribed. These are indeed suitable enough, and afford the requisite nourishment, perhaps even more than the solid flesh would give in such a state of debility, while they are generally easier of digestion, neither heat the body, augment the thirst, nor favour putrescence, but rather resist it, and are often very much relished by the patient.

996. But caution must be used, that broth prepared from animal food be not too rich, or given in too great a quantity, lest, by too abundant nourishment, it oppress the body, or heat it by it's stimulating properties. Besides, such broths, especially the stronger kinds, are sometimes more difficult to digest than the solid flesh taken in small quantity, and are more nutritive, and, of course, more heating. The stomach too, is sometimes ill calculated for digesting thin and fluid food, owing either to disgust at such food, which often happens (320.), or to defect of the accustomed stimulus which thicker, or more solid food, usually imparts to the stomach. Wherefore, it is sometimes not only allowable, but necessary, when the state of the body seems to render a flesh diet eligible, to allow patients, not quite freed from fever, flesh in substance, which is sometimes more readily digested than thin broths; or

at least to give toasted bread with the thin broth, that there may be something solid in the stomach. On some occasions too, some stimulants or condiments, such as a glass of wine, or a little common salt, though in their own nature ineligible, become necessary, because, without them, the patients would neither take food, nor could digest it when taken.

997. In fine, milk, and some preparations of it, hold a middle place between animal food and vegetables, being sufficiently nutritive, of little stimulant power, naturally acescent, and, instead of becoming putrescent, resists the putrescency of the system. It may therefore be allowed to patients in fever for both meat and drink, either unmixed, if not in too large a quantity, or what is better, lest pure milk should prove too nourishing, or weighty on a very feeble stomach, it may be given diluted with a large proportion of water, or, after extracting it's oil or butter, in it's thinner and more acescent state; or, what is best of all, the curd may be rejected, and, instead of the milk itself, the whey may be most conveniently taken which is somewhat nourishing, very restorative, moderates thirst, cools the body, resists putrescency, and gently relaxes the bowels.

998. As to the drink, in acute diseases, it ought in general to be very thin, somewhat acid; cold, unless in some few instances, in which cold cannot be endured, because of some particular affection of the stomach, or some other organ; it should not be such as to be disagreeable to the patients themselves; on which account it ought never to be medicated, as was formerly the practice, and still is in many nations. Whatever medicine the patient's case requires, let it be given as a medicine, in manner and form as little disgusting as possible; but let no infusions or decoctions of medicines by any means usurp the place of common drink, for they are generally so far from alleviating thirst, that they greatly increase it, render anxiety more intense, produce on some occasions nausea and vomiting, waste the strength, and sometimes induce diarrhoea; because, by the disgust they create, they either deter the pa-

tients from drinking, when drink is indispensible, or if, according to the orders of their medical attendant, they be copiously drank, they are not digested by a stomach already surfeited and loathing, nor absorbed from the intestines by the lacteals, to be conveyed into the blood; but retained, distend the stomach, or, by their heat and moisture, relax, unbrace, and weaken it, and of course obstruct it's functions, and in a surprising manner increase the general debility.

999. Weak drinks, however, such as persons in good health use for refreshing the body when any how warmed, and for quenching thirst, are also allowed to feverish persons, not only without danger, but with every advantage which could be expected from a medicated potion: such are cold water, water poured on toasted bread, or mixed with a little wine or lemon juice; the small beer of our country; or that liquor which the Russians prepare called Quass, which are all well adapted to counteract heat, thirst, putrescence, costiveness, debility, and, in a word, all the peculiar symptoms of fever: unless perhaps in some cases, when, on account of acidity in the stomach, or violent diarrhoea, acid or acescent drinks, such as negus, ale, and all fermented liquors, are inconvenient. In such case it is necessary to have recourse to the other drinks just now mentioned, or to the decoction of oats or barley, which some patients relish better and ask of their own accord. It must also be observed, that weak fermented liquors, a little wine and water, or even a glass of wine unmixed, are sometimes more grateful to the patient, and quench thirst more effectually than any watery drink; because they powerfully resist putrescence, and repair the strength; even wine does not in all cases heat the body, but sometimes evidently cools it; and so far are acescent drinks from always increasing diarrhoea, that they not unfrequently check it (990.).

1000. In fine, the drink of feverish patients ought to be very much varied and changed, either at their own request, or whenever they feel disgust at what they had formerly been using; that they may be in some measure induced to take it freely by the pleasantness of the liquid, and the refreshment which they feel from it; that they may not need orders to drink at the will of the medical attendant, or be forced to take too much, which is not without serious inconvenience, or even danger; unless, when through delirium or stupor, they can neither feel nor ask any thing; in that case it is necessary to put them in mind to drink (213, 648.).

1001. These observations were requisite, particularly concerning the food and drink of persons labouring under such diseases. As to the chronic, and such as are entirely free of fever, or merely have a little proceeding from some other and primary disorder, these often require very different treatment, though there are indeed many directions concerning diet common to both classes of disease, and which are therefore not to be repeated.

1002. In the first place then, there is this striking difference between them, that, while in acute diseases, the appetite for food fails to such a degree, that there is sometimes a dread lest patients, whom disease has spared, be carried off by abstinence; in certain chronic diseases, on the contrary, the appetite is so vigorous, that there is frequently no slight danger from plethora: when, for instance, from the nature of the disease, the stomach is either not at all affected, or is so affected, that the appetite is less injured than the power of digesting food, and thus it is oppressed with a useless and noxious load; or when the appetite and digestive power is equally vigorous, and thus, especially under the depraved influence of a habit of luxury, a quantity of aliment, more than sufficient for one in perfect health and vigour, and in the use of diligent exercise, is taken and digested by a person under debility and disease, while, through disorder and infirmity, he cannot use that mode of life, particularly that bodily exercise, which alone can exhale such a mass of food, or defend the constitution from it's noxious effects. Therefore, in such a state and mode of life, it will not at all surprise us, though there be an aggravation of the primary disease, or an accession of new and severer disorders.

1003. In many chronic diseases, as in plethora, haemorrhage, phthisis, palsy, gout, diarrhoea, dropsy, hysteria, dyspepsia, insanity, cancer, melancholy, epilepsy, scrofula, scurvy, &c. the cure, either in whole, or in part, is committed to diet; and the numberless and very peculiar instructions concerning it which practitioners are in the habit of giving to their patients, must respect a variety of objects, the nature and origin of the disease, and the state of the patient likewise.

1004. It is especially requisite that the food be of such quality, and in such quantity, as to be adapted to support and refresh the body, and, at the same time, not afford too much nourishment; that it be of easy digestion, increase none of the symptoms of disease, induce no new disorders, but be opposed as much as possible to the morbid condition of the body, and operate as a remedy. And it is truly a matter of no small moment, that the diet prescribed to the sick should not be too disagreeable to them, lest the physician's directions be either entirely neglected, or negligently observed; for few possess such vigour and firmness of mind, as to lay a restraint on themselves for the necessary length of time, or to obtain the cure of disease on such hard terms.

1005. With respect to the quantity of food, it can scarcely, if at all, be limited; for, besides that the quantity absolutely necessary varies exceedingly in different persons, and in the same person at different periods, it is much more difficult for them to limit themselves in the quantity, than in the quality of their food. Many voluntarily abstain from the pleasures of a splendid table, which they know to be injurious, who yet have great difficulty in resisting the daily importunities of appetite; wherefore, it will scarcely be needful to prescribe the quantity of aliment, unless some more serious danger threaten, or the patients themselves have already felt the inconvenience of their own voracity; in that case, indeed, a very spare and very slender diet may be necessary, perhaps even abstinence for some time may not be unserviceable.

1006. But because it is such a difficult and ungrateful task to prescribe the quantity of food, practitioners often endeavour so to determine it's quality, that the patient, while he indulges his appetite, and takes his food till he be satisfied, may neither have too much nourishment, nor eat any thing which the stomach cannot digest; and thus the stomach is not oppressed, and the plethoric state of the system is prevented.

1007. The several kinds and preparations of animal food are much more nutritive than vegetables or milk, and of course are often forbidden, while the latter are commonly allowed to patients at pleasure. Perhaps, in most cases, this direction may be sufficient to determine the quantity of nourishment, at least so far as to prevent the body from becoming too full. It is, however, in many cases necessary to take care, lest one who lives on milk and vegetables, common bread for instance, become not plethoric, through the great quantity taken. For, if a daily allowance of two pounds of well fermented bread, with three pounds of cows milk, suffice for supporting a strong healthy man under a great deal of exercise, it is evident that the half, or perhaps the third part of that quantity, would be too much for a sick person, enfeebled, indolent, and confined to bed; yet, as much and more is often taken by patients, who imagine they are on a very slender diet.

1008. Much injury is also done by that direction concerning the health of valetudinary persons, common and plausible indeed, but, in fact, quite silly, and often dangerous; that they eat frequently in the course of the day, and take but little at a time: the intention is doubtless to prevent the stomach from being oppressed with too much food at once. But in guarding against this danger, they run into another; for, on this plan, many in a diseased and enfeebled state, devour more nourishment in the space of a day, than those in health; thus, the stomach is also much weakened, being hardly ever duly emptied: for nothing contributes more to preserve it's powers, or to restore them when they have been impaired, than seasonable evacuation, and sometimes even a little abstinence, at least for a longer period than usual (617, 9.).

1009. It is certainly not the least excellence of a diet of milk and vegetables, that the food prepared from them is used in a form sufficiently simple and almost natural, neither spoiled by condiments, nor so changed by cookery, as to invite to excess. For a similar reason, animal food, when on account of the nature of the disease, or condition of the patient, it is allowed in protracted diseases, ought, like vegetables, to be cooked in the simplest manner, as by roasting or boiling; seasonings, and variety of aliments, must be avoided, both having a tendency to excite an appetite, which otherwise would not exist, and thus prove incitements to voracity (638.).

1010. There is, however, more requisite in the treatment of patients under chronic diseases, than merely allowing them food sufficient for moderate nourishment and guarding against excess; it is also necessary that it should be easy of digestion, neither loading, or otherwise injuring the stomach, a matter, indeed, of the greater moment, that some chronic diseases evidently proceed from a morbid state of the stomach, and many others are in the closest manner connected with affections of that organ, so that the chief hope of cure lies in restoring it's powers. But it is very difficult to give any certain or definite directions about a matter so uncertain as the faculty of the digestion of aliments, and which depends on so many various circumstances, particularly the constitution of the patient, present state of the stomach, nature of the disease, power of habit, the patient's mode of life, and sometimes his disgust and dislike, or desire and preference of certain kinds of food. For many descriptions of food, even the most excellent, cannot be said to be either easy or hard of digestion in their own nature, but merely from the state of the stomach, in which they are either well digested or corrupted.

1011. But it may be affirmed with safety, that all kinds of food, whether animal or vegetable, are more difficult to digest, when taken raw, than when cooked (638.).

1012. Flesh meat also, when too much roasted or boiled, is harder to digest than when it is more moderately or slightly done; unless, in the latter case, it occasion disgust, which impedes the digestion of food of every description.

1013. All oleaginous substances, as fat, butter, or oils, are more difficult to digest than other kinds of food; especially when burned or fried; on which account they are always to be shunned by sick persons, or at least, must be used very sparingly, either as food or seasoning to other dishes, which they sometimes spoil, and which would have been of good and easy digestion without them. This is the reason why flesh meat is often allowed to patients on this condition only, that they eat it with no other seasoning than it's own juice or broth. For the same reason too, patients ought always to be warned against taking much butter or oil, even with vegetables, such as pot-herbs or esculent roots, as is the custom among many nations.

1014. Flesh meat, salted or cured with smoke or spices, or dry, hard, and tenacious, is digested with the greatest difficulty, and, of course, almost always forbidden to the sick; unless, perhaps, when it is necessary to gratify vehement longing, or when the weakness of the stomach requires some food unusually sapid and grateful to the taste, in order to stimulate and rouse it to proper action, when it would otherwise be inadequate to it's office.

1015. There is not great variety in the flesh of the several terrestrial animals which is commonly brought to our tables. The flesh of the younger seems somewhat more difficult of digestion than that of the full grown; and the flesh of birds more than that of quadrupeds. That of wild animals is accounted more salutary and easy of digestion than that of the tame species, as being less fattened, and living in a more healthy and natural way. The flesh too of certain aquatic birds, as of ducks, geese, and the like, affords a stronger and generally a more weighty food than that of other birds.

1016. But there is a greater difference between the flesh of different fishes. All indeed abound in nourishment; when simply boiled, some are digested with the greatest ease, others, on the contrary, with the greatest difficulty; but when fried, or eaten with much oil or butter, all kinds are very difficult of digestion. In particular, salt water fish, the flesh of which is white, afford a good and light food. The same may be said of oysters, crabs, lobsters, and other shell-fish in general. But fishes, the flesh of which is reddish, whether inhabiting rivers or the sea, as salmon, herring, mackarel, &c. furnish very strong nourishment, but are, for the most part, hard to digest, owing partly perhaps to the nature of the flesh, partly also to the great quantity of oil which they contain.

1017. Even cow's milk, though generally a very excellent and very light food, is sometimes hard to digest, and becomes very oppressive to the stomach; because, after it is once coagulated (634.), it is not easily dissolved again, through the hardness and tenacity which it acquires. In this state milk naturally thinner, as that of asses, will answer better, or even cow's milk diluted with water and mixed with sugar. Cream, which for the most part is mere oil, is with little exception found difficult to digest. But of almost all the different sorts of food that are in common use, cheese is the hardest of digestion, especially when toasted, owing both to it's singular tenacity, and to it's oil being burnt and fried. Old cheese, however, which has already begun to decay, is generally found easy enough of digestion; many indeed are of opinion that it is not only easily digested itself, but that it promotes the digestion of other aliments, especially such as have a natural tendency to acidity. But this benefit, it is likely, is rather to be attributed to the stimulus which it imparts to a weak stomach, than to it's putrid nature, which, according to common opinion, is so much opposed to acidity.

1018. Every kind of grain, before it be fermented, is difficult to digest, and of course is suited only to more vigorous stomachs; but when well fermented is very easily digested, so that it agrees even with the most delicate patients. For a like reason esculent roots, such as potatoes, which contain much farina, are little suited to the sick. Farther, for the same reason, many leguminous vegetables, such as pease, beans, and the like, which in their green and tender state are so easily digested that they are safely allowed to the most of patients, as soon as they become ripe and mealy, become more difficult to digest.

1019. The greater part of esculent and oleraceous herbs, as turnip, parsnip, cabbage, or spinage, the more tender they are, the more easily are they digested by a weak stomach. But we must attend more to the tenderness of the individual plant than to it's species, for the common cabbage, eaten as food, sometimes oppresses the most robust, while very infirm persons eat cauliflower or brocoli with impunity, and digest them well.

1020. Ripe fruits are generally very salutary, and sometimes are preventives against many diseases, and carry off some that already exist: they are quickly dissolved aud easily digested in the stomach, provided they have not been taken in too large a quantity, or at an unseasonable time. They are safest when taken either for breakfast or supper, or a little before or a little after dinner: not immediately after dinner, it being evident that they must do no small injury if taken when the stomach is full, or perhaps already overloaded. But if the stomach be very weak, and particularly liable to acidity, then fruits, though ever so ripe, must be altogether withheld from the patient, or allowed in a very cautious and sparing manner.

1021. Many patients who have long been accustomed to live for the most part on animal food, if at any time they are for a variety of causes put on vegetables, as a more suitable diet, are with the greatest difficulty brought to the use of them, cannot take them without disgust, or cannot digest them when taken without great disturbance in the stomach. Yet, by prudence and perseverance, withdrawing or diminishing gradually the quantity of animal food, and proportionally increasing the supply of vegetables, almost all men may be brought to have sufficient relish for them, to take them without inconvenience, and, if circumstances so require, to live either on vegetables alone, or at any rate for the greatest part of their food, and that not only without danger or inconvenience, but with great benefit.

1022. Of those things which we commonly use for breakfast, tea, coffee, or chocolate, the last only furnishes any nourishment, for the two former supply none except by the help of the milk and sugar mixed with them. Besides, they exert a certain sedative and solvent power in the stomach, especially when drunk warm, and of course are unfavourable to health; on which account they are to be forbidden or very sparingly allowed to almost all patients labouring under chronic diseases. But chocolate containing much of an oily and farinaceous nature, is very nutritive: and the beverage prepared from it, provided it be well cooked, not made too thick, when the seeds have been reduced to a very fine powder, and not mixed with spices, is by many people well digested, and therefore proves to them a very proper food.

1023. Fresh eggs also, when not hard boiled, are both nutritive and easy of digestion, and of course are in general good and salutary food, and are often with great advantage substituted in place of other things for breakfast or supper.

1024. In fine, the selection of food in chronic diseases must be a matter of no slight importance, taking into account the nature of the disease, to which the food ought to be so accommodated that it may resist it as much as possible, and correct in some measure the morbid state of the body. Thus, in dropsical diseases, a dry and solid diet of roasted flesh, or the like, is the most suitable: but in putrid diseases the diet should be slender, consisting of vegetables, such as fruits, &c. But these things will be more largely treated of afterward, under the various titles of the remedies which operate against the several morbid conditions of the body.

1025. The drink also of patients in chronic diseases requires considerable attention, inasmuch as it may, in the same manner as food, affect either the stomach alone or the whole system. All drink, in its origin and nature, is mostly water, and this, when pure from the fountain or the stream, has nothing pernicious in it, and is suited and accommodated to all patients and to every stomach, however delicate and weak, unless in some a portion of strong drink is felt necessary, in consequence of a depraved habit. There are indeed many waters which, from different causes, may prove noxious to the body; as also many medicinal waters, which prove very salutary in several diseases. But this is not the place for treating of these.

1026. Pure spring water, especially new drawn and cold, is the best, most salutary, and commonly the most grateful drink to thirsty persons, whether in health or sickness, as it quenches thirst, cools the body, dilutes and thus blunts acrid matters, provokes urine, and ofttimes sweat, expels noxious matters, resists putrescence, assists digestion, and, in short, invigorates the stomach.

1027. There are, however, some persons, though very few, of great weakness either of the whole system or of the stomach only, whom the coldness of the water seems to injure. The same water will agree very well with these, when it has been slightly warmed, or softened by being boiled and permitted again to cool.

1028. But in all times and places men have been skilful in providing themselves with certain fermented and intoxicating liquors, and often use the weaker sorts, at least of such liquors, as their common drink, as they do the stronger kinds as a luxury; so that for a number of years many persons have never once tasted pure water, which is almost the only natural drink. Farther, many have been so accustomed to these that they cannot be deprived of strong drink without serious inconvenience.

1029. Of those liquors, wines and ales of various kinds are most in use, and are generally safe for persons in health, and salutary to many in disease, if they be not taken to excess, and be of a good quality, that is, well fermented, and not yet too far advanced toward acidity.

1030. But, in chronic diseases, they are not without some inconvenience, or, in some cases, even danger. Particularly, they supply nourishment to the body, which water does not, and they perhaps do so when there is no need at all of such a supply, and in this way prove noxious. Besides, they stimulate and heat the body, though it is perhaps too hot already. And, in fine, being naturally acescent, they often injure a stomach already weakened, and generate acidity in it ; impede the digestion of aliments, the nutrition and refreshment of the body, and consequently weaken it in a short time.

1031. Some of those liquors being weak, and therefore very prone to acidity, and others again of a stronger nature, by first stimulating and ultimately weakening the stomach and the whole system, greatly injure the sick. If it is intended to drink sparingly, the stronger wines of Spain and Portugal are the best and most salutary ; if more freely, the purer and sounder of the French wines are safer either in sickness or health. But of malt liquors, that strong and bitter one, called London Porter, is the most salubrious, the most suitable, and almost the only one that can be allowed to the sick, particularly those labouring under stomach complaints.

1032. But besides all fermented liquors, those very strong liquors called distilled spirits, are in daily use with many, either unmixed or mixed with water and other matters. These indeed are quite free of certain inconveniences of wines, for they neither supply nourishment, nor sour on the stomach, but rather oppose it's acidity ; they likewise evidently possess considerable advantages ; they stimulate the stomach and the whole body, and thus frequently promote the digestion of aliments which might otherwise be very difficult. But they are nevertheless always attended with numerous inconveniences of the very worst kind, and are deservedly accounted the most pernicious of all things which human luxury has hitherto invented. They often injure by their excessive stimulus, and still more frequently by producing debility: they are particularly hostile to the nervous system, to the stomach, and liver; whence general weakness, and dreaded incurable dropsy, either from that weakness, or from the obstructions of the viscera which these liquors generally produce. It is therefore very seldom that patients are permitted to use distilled spirits, however diluted, for such is the force of habit, that though by no means palatable at first, they gradually become more so, till they are drunk unmixed. Sometimes they are rendered mild by being made up in our country beverage, called punch, not only diluted with a good deal of water, but mixed at the same time with sugar and the juice of certain fruits. But it has then no peculiar advantage, for that liquor, like wine, or even still more than wine, becomes acid in the stomach, and is more noxious to the whole system.

1033. There remains yet one other matter which is more necessary than even food and drink, not only to the healthy, but most of all to the sick, whether labouring under acute or chronic diseases, and often proves of more value than all medicines and medical skill; that is, pure and good air, than which nothing is more necessary to retain health or preserve life, nor any thing of greater advantage for the cure of many diseases; for without it the most excellent and powerful medicines have little or no effect, and diseases naturally slight and of easy cure, become quite malignant, and often incurable.

1034. For by means of pure air, that noxious mephitic vapour which persons in the best health, much more the sick, are always exhaling from the lungs and skin, is carried off and diffused through the atmosphere, till it's pestiferous tendency being destroyed, it becomes harmless both to themselves and others. Besides, pure air refreshes and cools the body, reinvigorates the strength when impaired, assists the appetite and digestion, and strongly resists putrescence, especially when somewhat cold. In acute diseases, it is of the very first necessity, for reasons sufficiently manifest, especially in contagious fevers. In all diseases of that class, pure air, and that renewed as often as possible, is both salutary and necessary. In many of them, the air is both most salubrious and most agreeable to the patients themselves, when it is somewhat colder than would be either agreeable or safe for persons in health. All acute diseases however, will not bear the air so cold, especially those which proceed from having caught cold, or in which the lungs are much affected, whatever may have been their origin. But hot, foul air, corrupted with morbid effluvia, stagnant, and not properly changed, is very injurious in all diseases.

1035. In chronic diseases too, the efficacy and utility of good air is very considerable, in some cases indeed it is the only hope and defence. But it ought always to be pure, which it cannot be, unless frequently renewed. Generally a dry air is most salubrious, as it greatly corroborates and stimulates the system, promotes perspiration, increases the appetite for food, favours digestion, and is generally most accommodated to respiration: yet it is said that some persons under pulmonary disorders, feel easier in a foggy moist air, than in one pure, dry, and serene. In some cases, air rather warm, in others somewhat cool, is more beneficial in chronic diseases, according as they originate in cold, torpor, or suppressed perspiration on the one hand; or on the other, in heat, and excessive laxity and irritability of the system. In fine, a temperate, serene, moderately warm, and above all, a steady climate, at least not liable to sudden changes of temperature, is in almost all diseases most salubrious; and in some, as in phthisis, in which remedies have little effect, it is the best of all remedies.

1036. But the influence of air, both in inducing, alleviating and removing diseases; or in either invigorating or debilitating the system, is not yet fully understood. But there are not wanting many arguments and observations, to shew, that in these things air is of the greatest efficacy, and that the most valuable assistance might be derived from it, provided it's application were more fully understood.

CHAP. XXVI.

Of astringent remedies.

1037. Since the human solids, as has been already observed in the proper place (80, &c.), either owing to nature, to a depraved habit and mode of life, to various morbid causes, or to effects of preceding diseases, frequently become relaxed beyond measure, debilitated and flaccid, and inadequate to the purposes of life; there is an obvious necessity for some remedies to correct such debility and laxity, and restore our solid parts to their original healthy firmness. Such remedies are by medical men called Astringents.

1038. That certain substances possess such a property of giving density, firmness, and strength to animal solids, is evident from many circumstances, particularly from the common and well known art of tanning and preparing leather by oak-bark, and other similar matters, till it acquire great hardness and firmness.

1039. It is also manifest, both from reason and experience, that numerous substances have somewhat of a similar effect on the living body. The manner, however, in which they produce this effect is hitherto but little understood; whether, as some suppose, by interposing new particles between the original ones to connect them more strongly, and of course render the whole fabric more firm; or, as others are more inclined to believe, by adding little or no new matter, but by drawing more close the bond of adhesion between the former particles, which being brought to closer contact renders the matter harder. It were surely better to hazard no conjectures on a matter so obscure and uncertain, than to entangle ourselves in a variety of inaccurate opinions, neither fitted to explain the fact, nor accommodated to any medical use. It is, however, sufficiently ascertained, that the solid matter of animal bodies is rendered firmer, the particles of which they consist being on some occasions drawn into closer contact, without even the least change of composition, and at other times the more humid particles which had rendered them soft being dissipated. Whether indeed astringent medicines produce their effect in any similar manner, or on a principle entirely different, is not clear; neither is it of great moment, while the effect itself is certain, and their nature and use sufficiently known.

1040. Many medicines, and those indeed of very different natures, are deservedly classed among astringents; and all medicines which possess this property, are derived either from vegetables, or from fossil substances.

1041. An astringent power resides in numberless plants, and in their various parts; as in the root, bark, wood, leaf, flower, fruit, and inspissated juices; of all which you have instances in the bark of the oak, root of bistort, and of tormentil, logwood, leaf of uva ursi, petals of the red rose, flower of the pomegranate, apples, gum-kino, &c. But the astringent quality is found greatest in the bark of plants: and, in astringent roots, or certain fruits possessing that power, as in the pomegranate, the greatest efficacy is in the bark or peel.

1042. The balsams too, as they are called, that is the juices of certain resinous plants, are numbered among astringent medicines, and prescribed as such in certain diseases, not without benefit; although it is evident they possess no real and pure astringent quality, and many things shew that they are beneficial in those diseases, on a very different principle.

1043. In fine, there is considerable astringent power in the juices of certain plants, not only such as are naturally acid, as lemon juice, but also such as are naturally sweet and bland, and only acquire their acidity and astringency after fermentation. Thus, many wines, especially the red, though new and excellent in their kind, have some astringent power; but all wines, and all fermented liquors, ale, &c. after becoming acid, are considerably astringent.

1044. It is worthy of observation, that in the greater part of plants which have bitter roots, the bark is more or less astringent. Besides, almost all bitter vegetables seem to possess astringency in a greater or less degree, and, in fact, are often prescribed by physicians as astringent remedies. It is also easy to detect this property in any herb, not only by the harsh and ungrateful taste which is common and uniform in all astringent substances, but with still greater ease and certainty, by the black colour which the herb or it's infusion instantly produces, when mixed with a solution of sulphate of iron.

1045. All astringent medicines taken from the vegetable kingdom, are so mild and safe, that they may be taken inwardly, and the use of them long continued without difficulty or danger, in larger or smaller doses, according to the strength of each.

1046. Numerous astringent medicines are likewise derived from fossile substances. These, again, are either earths, metals, or salts, which last are pure, earthy, or metallic.

1047. As to the pure earths, though many of them were formerly used as astringent remedies, and not a little celebrated by some practitioners, it is nevertheless still very doubtful whether any of them possess such a property. The boles, as they are called, are not astringent, unless perhaps from a mixture of other substances. Lime, indeed, seems to possess some property of that kind, whatever may be the proper way of accounting for it; since it not only produces some astringent effect on the living body, as in fluor albus, in which lime water seems to have beneficial effects, but it is also singularly useful for the tanning and hardening of leather: the former of these effects however may possibly admit of explanation on some entirely different principle, and perhaps the latter may be wholly referable to it's effect on the oak-bark.

1048. Of the metals, four are employed as astringent remedies, namely, copper, lead, zinc, and iron, of which the two former are so dangerous, and even poisonous, that they ought never to be taken inwardly except in very small quantity, and with the utmost prudence and circumspection. Iron, again, may frequently be taken in considerable doses, and with great benefit, either filed down very fine, or reduced by various means to the form of a carbonate. The oxide of zinc, too, is sometimes largely taken, the powers and uses of which, though much celebrated, are not yet well ascertained.

1049. Of the salts again, some possess a great astringent quality. The pure acid salts particularly, without exception possess this property, as is evident from their manifest effects both in the living system, and in tanning leather: but they do not all possess it in an equal degree. The sulphuric acid is the strongest of them all in respect of astringency, whether as applied in medicine or in the arts. Perhaps the muriatic acid holds the next rank to it; then the nitrous; both of which are seldom employed, in a pure state at least. Vinegar, also, or the acid juices of plants, or subacid wines (1043.), have a similar property, but in a still weaker degree: but these are decomposed and changed in our bodies with much more readiness and ease than the former, their original character being nearly lost, and a new one assumed during fermentation (566, 628.), so that in a little time their acidity, and perhaps also their astringency, no longer exists. But the fossil acids appear to preserve their peculiar character longer, and therefore have a greater and more certain effect on the system as astringent remedies.

1050. Of the earthy salts, the sulphate of alumina seems to be by far the most excellent astringent, and almost the only one now in use. It is indeed a very powerful remedy, and being at the same time neither dangerous nor noxious, it may be used freely either in a dry and solid form, or dissolved in any fit menstruum. The sulphate of alumina seems to have it's astringent power, in a great measure at least, from the sulphuric acid which it contains.

1051. As to the metallic salts, scarcely any are used as astringents, but those formed from copper, zinc, lead, or iron; and their powers will therefore be easily understood from what has been already observed (1048.).

1052. Sulphate of iron is a very powerful, and at the same time a sufficiently safe and suitable astringent medicine; but partly owing to it's ungrateful taste, partly to the stimulating effect which it usually has on the stomach, sometimes to nausea and vomiting, it cannot be taken in so large a dose as the pure carbonate of iron (1048.); but taken in a smaller dose, it produces the same salutary effects on the body. It is also probable, that the iron itself, taken in the form of a carbonate, is most beneficial to the whole system, when it is dissolved by the acid in the stomach and intestines, and converted into a salt not dissimilar to sulphate of iron; which being taken up by the absorbents and conveyed into the blood, pervades with it the whole frame of the body.

1053. The sulphate of zinc is a much more powerful astringent, but less fitted for being taken inwardly, on account of the violent and sudden vomiting which it excites almost immediately after being received into the stomach. But applied externally as an astringent, it is a most excellent remedy. The same holds true of the acetite of zinc.

1054. The acetite of lead, and all the other astringent medicines prepared from that metal, though excellent and powerful remedies, are still attended with a very serious inconvenience. If received in the smallest quantity into the body, they operate nearly as poisons, and in large doses would prove certain destruction. On which account some degree of prudence is requisite in the use of them, even in external applications.

1055. Then as to salts prepared from copper, the chief of them, the sulphate, is both very dangerous on account of it's virulent nature, and very difficult to administer on account of it's exceeding acrimony, so that it cannot easily be applied even to the external parts, much less be safely received into the stomach as an astringent remedy. The ammoniaret of copper prepared from this, is indeed a much milder medicine, but still it cannot be taken in large doses on account of the nausea and vomiting which it usually excites, and when taken in small quantity it seems to have little effect.

1056. Farther, from the same metals certain tinctures are prepared, especially from iron, with the muriatic acid, and from lead, with acetous acid and alcohol; the greater part of which have the same properties and the same inconveniences as the metals themselves, or the metallic salts from which they are prepared. The tincture of muriate of iron, is indeed a remedy both of sufficient efficacy, and more grateful to the stomach, and sits easier on it, than either iron itself or it's salt; perhaps it is more convenient for being received into the blood, and conveyed through the whole system. The saturnine tincture, as it was formerly called, is also but rarely or sparingly given inwardly, on account of the poisonous nature of lead (1054.); but it is often freely and successfully used in external applications. In such tinctures both the medicine which is dissolved, and the solvent liquor, may prove beneficial.

1057. But besides all the medicines, either internally or externally applied, there are other remedies (952, 3.) which are often and with signal benefit prescribed as astringents, and in some cases far excel the medicines already enumerated, as will be very plain to any who duly understand the causes which relax and render our bodies flaccid (82, &c.). Thus, as thin watery food, superabundant drink, an indolent and sedentary mode of living, and heat in excess or too uniformly applied to the body, in various ways unbrace and relax all it's solid parts, it must be very evident, that an opposite mode of life and diet, much exercise, dry nourishing food, sparing drink, and cold prudently applied, will correct those disorders, and most effectually restore to the bodies of the sick their just and natural firmness. Nor does experience contradict what reason so plainly teaches, but proves and establishes the same beyond a doubt. But these remedies must be treated of at greater length when corroborants come to be considered; because they not only affect those parts of our bodies, which, for distinction's sake, are called dead solids (76, &c.), but also have a powerful effect on the living solids (109, &c.), greatly increasing the vigour of these, along with the firmness of the other parts.

1058. The first and simplest effect of astringent remedies is to give firmness, density, and hardness to the solid parts of our bodies, which they perform with sufficient certainty and effect, in those parts to which they are immediately applied, but with less effect on others more remote, or on the system at large, if that should happen at any time to be universally and preternaturally relaxed; although it is extremely probable that many of them are received into the blood with little change, and retaining their original properties in their vigour, and of course pervading the whole body, and affecting it in the most general manner possible.

1059. Nor indeed are the effects of astringent remedies confined to the simplest fibres, or to the minute elements of the solid parts, whatever these may be (95.), but are extended also to the cellular texture, and to all the organs formed from them. In particular, the blood-vessels, both arteries and veins, readily feel their operation, and are greatly and often suddenly constricted. The living solids (109.) are also equally affected by them, and owing to the close connection which subsists between their peculiar properties—sensation and irritability, and the mechanical properties which they have in common with the other solids (373, 79.), while the latter undergo a change, and all parts of the body acquire greater firmness and rigidity, sensation and irritability are proportionally diminished, and some degree of torpor is induced.

1060. Hence the use of astringents will be readily understood in almost all the diseases in which they are usually prescribed; and it will at the same time be evident that in many they are of the utmost benefit.

1061. Therefore, in the relaxed state of the solids, whether general or partial, they become necessary, either by way of application to the part chiefly affected, as to the eyes after inflammation, or to the fauces and throat after quinsy; or taken into the stomach, and applied to the whole body, as in the case of dropsical patients, of convalescents from this or other diseases, or of those whose bodies are too much relaxed and weakened by a bad mode of life and other causes.

1062. Besides, from their effects on the blood-vessels (1059), they are often very useful for repressing haemorrhage, whether spontaneous or brought on by external violence or by art. Also, for a like reason, they have the best effects in checking some other discharges, as fluor albus, to which women are so subject (822), or that discharge of mucus from the urethra which often continues long very troublesome and obstinate after the cure of a virulent gonorrhoea,—discharges which in a great measure depend on the laxity and debility of the vessels.

1063. Farther, they are often found extremely useful in checking some secretions or excretions, when increased beyond bounds, as sweat or urine, the excess of which has it's origin, or at least it's increase, in the general debility of body, or peculiar relaxation of the parts, particularly the vessels most subservient to them.

1064. In discharges from the bowels, which are so many and of so various kinds (662, &c.), which are often very troublesome and dangerous, and in some cases very difficult to cure, astringent remedies are frequently very beneficial, and either remove the disease entirely, or at least allay and moderate it, even when owing to some cause which is naturally irremediable, there is no room to hope for a perfect cure. For a like reason, in the advanced stage of dysentery (668), when, after the bowels have been duly purged, the discharge continues obstinate, they are of the greatest utility, partly as strengthening all the solid parts of the intestines when relaxed by the violence of the disease; partly by constricting and straitening the minute vessels and foramina opening into the intestines, and pouring out their fluids too abundantly; partly, in a word, by abating and carrying off that morbid irritability of the bowels (371, &c.), which either is the origin and cause of the disease, or has been induced by the long continuance and renewal of it (663.).

1065. Lastly, though astringent remedies, in the first place, immediately and chiefly affect those parts which we call the dead solids, yet they sometimes greatly affect the living solids, increasing their vigour, but abating their irritability (371, 78.); they also exert no small power on the fluids, and either prevent putrescency, or, in some instances, correct it when present. On which account they are frequently of the greatest benefit in excessive mobility of the nervous system, in it's debility, and in putrescence, either general or partial (535, &c.). But such effects of astringent remedies must be treated of at greater length afterward.

CHAP. XXVII.

Of emollient remedies.

1066. Since the solid parts of the human body may be vitiated in one of two different ways, and become either too hard and rigid, or too soft and flaccid (81.), there is equal occasion for emollient remedies as for astringents, that the solids, become preternaturally rigid and hard, may be again reduced to their due softness, consistent with the laws of health.

1067. It is very well known that certain substances have such a power over the matter of which the bodies of animals consist (86, &c.), after it is dead, and separated from the body. Also that some remedies have the same effect on the living body, is sufficiently demonstrated by many very decisive experiments and observations.

1068. Nature, however, has furnished a more scanty supply of these medicines, or at least less variety of them, than of astringents. There are, indeed, not a few remedies, taken from various vegetables and animals, which are employed and celebrated as emollients; but all may be easily classed under two heads, the oleaginous, and the mucous or mucilaginous, as they are called.

1069. Such a soft and somewhat tenacious mucus is richly supplied by various vegetables; it is found in their various parts, as in the roots, leaves, and seeds; as in the case of the white lily, onion, marsh-mallow, mallow, flax, &c.

1070. But the bland and soft oils are furnished in great abundance by many animals as well as vegetables. Although formerly much credulity, almost to superstition, prevailed among the mass of the people, and even among physicians, concerning the singular and wonderful properties and excellencies of the oils or fat of various animals, it is now sufficiently evident that they all possess properties nearly or entirely the same.

1071. Butter, the oil which milk yields in considerable quantity, holds the nearest place to the fat of animals. Milk itself too, is justly reckoned an emollient remedy, both for it's aqueous nature and for the oil which it contains.

1072. There seems to be little difference between these and the mild and thick vegetable oils, which are by pressure copiously extracted from certain fruits or seeds, as from olives or almonds, &c.; these are therefore deservedly classed among emollient remedies.

1073. But of all medicines of this kind, by far the most powerful and certain is pure water, especially when warmed; for the innumerable decoctions, fomentations, and infusions, which are so frequently prescribed, and so much celebrated for their emollient qualities, are generally nothing else, and have no other virtues than pure warm water. And indeed many experiments, instituted on purpose for investigating this matter, afford sufficient proof that the greater part of the oils, juices, and other substances commonly so highly extolled for their emollient qualities, possess them in a much less degree than water itself. However, it would not be reasonable to conclude, on that account, that those oily and mucilaginous substances which we commonly use do no good. For it is very certain that they render the solid parts of animal bodies more soft and flexible, by moistening, and, as it were, besmearing them with oil, facilitating the motion of the particles among themselves, by diminishing or removing the friction which impeded it. Besides, pure water, and very many aqueous liquors, whether applied warm or cold, are soon dissipated by evaporation, and by that means leave the external parts which had been fomented with them to dry and stiffen. But oily and mucilaginous applications are generally free of this inconvenience, at least they are much more slowly dissipated. Therefore they are properly mixed with all fomentations for softening the external parts.

1074. As to the effect of pure water or the greater number of aqueous liquors, there is no difficulty at all in explaining how they operate in softening the human solids when they have become too rigid. For, as was explained in the proper place (82.), these are either harder or softer, according to the proportion of the various elements which enter into them, and become either rigid through defect, or soft through the excess of humid matter in their composition. But water, or watery liquids applied to the body, or taken into it, pervade all parts of it, being either taken up and conveyed by the minute vessels, or penetrating by invisible pores, and thus uniting with the drier particles with which they come in contact.

1075. But beside emollient medicines, either taken inwardly or externally applied, in the various forms of fomentations, &c. there are also other remedies, which operate on the human body with a similar and not inconsiderable power.

1076. Among the first of these we may mention heat, especially when combined with moisture, which relaxes and softens the solid parts of our bodies in a surprising manner. Dry heat, also, has a similar power, but not to such an extent. Besides, our bodies are naturally not a little moist, and therefore more readily and to a greater degree affected by heat. The internal parts of the body, indeed, commonly preserve their proper and natural temperature, with little change; but the external parts may be very much affected, and rendered soft and flexible by heat, though they had previously been very rigid. Also, when unusual heat is applied to an internal part, as the stomach or lungs, into either of which certain warm matters may with sufficient ease and safety be introduced, these parts likewise experience a similar effect, in some cases salutary, in others very pernicious.

1077. Farther, since the solid parts of our bodies, naturally soft, become very rigid by great and unusual distention (90), and again flaccid and soft by relaxation, it is evident that this last will sometimes prove useful as an emollient remedy. But we will have another opportunity of attending to the powers and effects of this remedy.

1078. Frequent and vigorous exercise, as was shewn in the proper place (88, 89.), most effectually strengthens either the whole system, or the particular parts which are chiefly exercised; in many cases also it renders them too rigid, both by dissipating the moisture beyond measure, and by too closely compressing and condensing the solid particles; and thus it proves at one time noxious to the body, and at another a remedy. But long rest and indolence, for an entirely opposite reason, debilitate and soften our bodies. Many things, however, prevent these from being often prescribed as remedies.

1079. Lastly, as some degree of rigidity is often induced by long rest (92.), reason itself points to motion and exercise, as far as opportunity permits, as being in some cases a suitable emollient remedy for parts which have become rigid by this means. Farther, parts which have already acquired some degree of rigidity, whatever may have been the first cause of the disorder, are more liable to an increase of it, because, being not so adequate to their usual motions, they are generally forced to rest. Wherefore, in almost all cases of morbid rigidity, either of parts moving (111, 304, &c.), or moved, as the limbs, and all the joints, we must hasten to diligent exercise as to our safest means of help and defence; at first to that which is slight and easy,—and when the rigidity is somewhat overcome, to that which is more vigorous; or should this happen to be utterly impossible, and the slightest motion could not be made without great pain, recourse must then be had to frequent and strong friction, which may, in a great measure, supply the place of exercise. This too is often the more easy and efficacious, when the parts to which it is to be applied, are previously anointed with oil, or some oily applications (1070, &c.).

1080. With respect indeed to the effects of emollient remedies on the human body, they are very simple and easy to be understood. In the use of them, the solid parts are rendered less elastic or resisting, but more flexible; and, of consequence, some parts which previously hardly admitted of motion, are afterwards moved with much greater ease.

1081. But these effects are more early and more evidently observed in parts to which the remedies are immediately applied, suppose a limb, or the surface of the body, than in remote parts, or in the system in general. On some occasions, partly by means of sympathy, or that general tie (356.), by which all the parts of the body are united,—partly by means of some of these emollient remedies taken into the body and conveyed through the whole frame,—it's remotest, or perhaps all it's parts, are in some degree similarly affected. This will indeed occasion the less surprise, and will be the more readily understood, if it be recollected, that not only the simplest and minutest elements and particles of the solids are softened and relaxed, but that all the organs, and particularly the vessels formed from them, participate in the same effect. Nor is it difficult to assign the reason why the relaxation and softening of some portion of the blood-vessels is attended with the speedy relaxation of the whole; namely, because that distention (90, 321, &c.), on which their firmness, and indeed all their powers in a great measure depend, is removed, or at least abated.

1082. Farther, through the very close connexion that subsists between the mechanical properties and vital powers of the nervous system, it cannot but happen, that while all the solid parts of the whole frame are, by means of remedies, softened and relaxed, the peculiar powers of the nervous system will at the same time be affected and disturbed. Besides, seeing, as was just now stated (1081.), that the blood-vessels are affected and relaxed by the action of emollient remedies, it is evident, that by this change, the whole nervous system will be more quickly and intensely affected; for the motion of the blood, and the powers of the nerves and muscles are so closely connected (411.), that almost instantaneously the affection of the one operates powerfully on the functions of the other. It will not, therefore, be difficult to explain in what manner the action of those remedies may induce a relaxation of all the muscles, some degree of general debility, increased irritability, and other effects of the same kind.

1083. From these various effects of emollient remedies, it will readily appear, that the most part of them produce their beneficial effects in different classes of disease by different modes of operation; that they operate not only by their first and leading effect on the most simple solids, but even still more by their power in changing the condition of both the sanguiferous and nervous systems, whether eminently in some particular part, or in general over the whole body.

1084. In the first place then, in the general prevalence of morbid rigidity, emollient remedies are evidently necessary with a view to their primary and most simple effect. Such a condition of our bodies is indeed but seldom a disease, unless in aged people, all whose solids usually become too rigid from the various causes already explained (82, &c. 868.); whence they often suffer no small inconvenience, while their strength decays, their senses become dull, and every motion more difficult. Though there is no cure for this kind of rigidity, it is yet very fully established, that even in this state, certain emollient remedies in some cases afford no small alleviation, and, of course, prove a renovation of life when ready to sink; often protracting it for many months, in some cases, even for years. Thus, a warm summer succeeding a long and severe winter, removal to a milder climate, frequent use of the warm bath, more abundant and warmer cloathing, liquid diet, moderate exercise, and frequent friction of the skin, have, in not a few cases, been very useful to the aged.

1085. But rigidity is more frequently a topical complaint, affecting one limb or joint. Emollients are therefore necessary for abating or removing this, and they are chiefly to be applied to the parts affected. In this state then, the best remedies are—various warm fomentations of oily and mucilaginous substances, the bath, warm water poured from a height on the rigid part, frequent and diligent friction with oil, and moderate and frequent exercise, &c.

1086. Farther, when certain parts by much stretching have become rigid, as the arteries in a topical inflammation, emollients applied to the part inflamed, as fomentations, are useful for relaxing them, for loosening and softening the neighbouring parts, moderating the inflammation, and promoting the necessary effusion of fluids, and a mild suppuration. For much the same reason, when inflammation has terminated in an ulcer, they often conduce very much to the cure of the latter; especially when it's edges are callous, when the vessels which discharge the humour become hard, the humour sparing and acrid, and the suppuration malignant.

1087. In a similar manner also, in more general inflammation, and in fevers of various kinds, emollient remedies are beneficial; both by relaxing the arteries, together with the other solids of the body, and thus moderating the impetus of the blood; and especially by unbracing the skin, relaxing and opening it's pores; whence the perspiration, or perhaps sweat, flows freely and profusely, to the very great relief of the patient, and not unfrequently carrying off the fever entirely.

1088. Again, when, by excessive firmness, or at least too rigid contraction of the vessels or other parts subservient to them, the several secretions or excretions are become defective or obstructed, emollient remedies often remove obstructions and promote these evacuations, and thus in some cases provoke, for instance, urine or saliva. In relaxing the bowels also, when preternaturally constricted, they are very efficacious; sometimes when given by the mouth, though this is seldom or never attempted, unless other remedies for stimulating the bowels be given at the same time; but chiefly when injected by the anus in the form of clysters.

1089. In fine, they are sometimes of advantage by their effects on the nervous system, whatever be the manner in which they produce these effects (1082.); —as in excessive and morbid vigour, whether general, such as is observed on some occasions in insanity, or partial (376.), such as takes place in an inflammatory diathesis, violent fever, or inflammation;—or in excessive excitement of the nervous system, such as often happens to deranged patients, resisting sleep (300.), and which can with difficulty, or not at all, be composed by the usual remedies. Therefore, in these and similar cases, emollient remedies, by relaxing and unbracing the body, weaken the nervous system, diminish it's diseased vigour, and procure sleep, after long watching. But we must afterwards treat more fully of these, and such like effects of emollient remedies, under another head.

CHAP. XXVIII.

Of corroborating remedies.

1090. Next to those remedies which affect the solids of the human body universally, are classed those which affect the living solids, viz. the brain, nerves, and muscles, giving stimulus and intensity to their powers when defective, and diminishing and repressing them when in excess.

1091. However obscure and incomprehensible the powers and actions of these parts may be (117, &c.), their disorders, neither few nor slight, are at any rate sufficiently evident (370, &c.), though not yet well understood. Strong and effectual remedies are the more necessary for these disorders, because they are not only very frequent themselves, but are also the source, or form a constituent part of almost innumerable diseases, some of them extremely severe; since in every one of the functions of the human body, the nerves and muscles hold the most distinguished place. When these then are injured, or by any means reduced to an unhealthy state, it is plain, that, in proportion as the disorder is more or less general, the functions of the system, in whole or in part, 'must of necessity be obstructed.

1092. But from the disorders of the nervous system, of which the nature, causes, noxious consequences, and remedies, are in some measure understood, four subjects arise of primary consideration, very evident and very frequent: that is, defect of vigour, or debility; excess of the same, or excessive vigour; defect of irritability and sensibility, or torpor and stupor; and, in a word, excess of sensibility and of irritability, or a morbid condition extremely susceptible of agitation from the slightest cause. Of the natures, the causes, and the noxious effects of these disorders, we have already spoken in their proper place (370, &c.); and shall now attend to their several remedies in order.

1093. To begin, then, with those remedies which obviate debility, they are not improperly termed Corroborants; but by physicians are often called Tonics, as if all their action and efficacy consisted in increasing the tension, or tone, as many call it, of the muscular fibres (321, &c.). It is very certain that the powers of the muscles depend greatly on the tension of their constituent fibres, and are diminished or destroyed along with that tension: and that when it is augmented, within certain limits (323, 4.), they are also increased. It is also very probable that some corroborant remedies increase the tension of the muscular fibres, either partially or generally. But it is by no means probable that all produce their beneficial effects in the same manner; as to some indeed this is scarcely credible. It is better, therefore, and always, when practicable, will be better to decline the use of a term which contains in it something hypothetical, tending to lead the incautious into error, and in this, as in other cases, to give remedies a denomination expressive of their certain and manifest effects.

1094. Among corroborant remedies, the first place is justly due to astringents (1037, &c.). For all medicines, and other remedies which brace our bodies, and in any manner harden their fleshy parts, give intensity to the powers of the muscular fibres, and thus counteract debility.

1095. At first sight it might appear unnecessary to make any distinction between astringents and corroborants, to give them different names, and to assign them different qualities and places in a Conspectus of the Theory of Medicine; especially as the greater part of the remedies which serve the one purpose, are not ill suited to the other also.

1096. There is, however, a difference between them sufficiently marked, and by no means small. For the powers of the muscles fail, and in some cases great debility supervenes, when there is no unusual softness of the flesh, and, of course, no necessity for astringent remedies; nay, great debility may take place even when there is rather an excess of rigidity in the whole system. Besides, although all astringent remedies may sometimes prove corroborants, it is not equally true that all corroborants possess an astringent quality; there are even some of them which in no way affect the dead solids: and in the most decided astringent remedies, the corroborating power is not in proportion to their astringency, but is often found to be great when the other is small; and, on the contrary, is sometimes found small, or at least not at all remarkable, when the astringent quality is very great. Therefore, the usual distinction between corroborant and astringent remedies, is highly proper.

1097. The corroborating power which the greater part of astringent medicines possess, will be readily understood, from that remarkable connexion which subsists between the mechanical and vital properties of the human solids, which has been already copiously discussed. For if excessive softness produce debility, it is evident, to a certainty, that medicines which correct the former, must relieve the latter.

1098. But among truly astringent medicines, some appear beyond others to possess a marked corroborating power over the muscular fibres, or perhaps over the whole nervous system. Thus the Peruvian bark, though not a very powerful astringent, is deservedly esteemed one of the most efficacious corroborants, and, if medical writings can be trusted, invigorates the system in a far greater degree than medicines much more powerful as astringents. The same is the case with iron and it's various preparations (1048, 1052, 5.), which being often employed as corroborants, produce the best effects, even though taken in so small a quantity, that it is scarcely credible that the solids of the human body can acquire density and firmness, the usual effect of astringents, from any mixture or apposition of the particles of which these medicines consist. It must, however, be observed, that medical men are not yet agreed whether the Peruvian bark, so celebrated for many years, and prescribed in so many diseases, produces it's salutary effects by this mere corroborating power, or in a manner altogether different, and not understood. And it will be easily seen, that in whatever way that medicine counteracts any diseased condition of the system, it will, at the same time, have some corroborating effect; because almost all diseases, however differing among themselves in nature, origin, or effects, have at least this uniformly in common, that they more or less produce debility, either general or partial.

1099. In short, almost all bitters, especially those derived from vegetables, whose astringent quality is often weak, and in external applications little or nothing, seem to possess some corroborating power, and with this intention are often, too often, employed. For many of them, perhaps all, when taken in large doses, prove injurious to the body, and are not entirely free from the suspicion of some poisonous quality. At least they are evidently poison to some animals. Their action in the living body, and the mode in which they corroborate the muscular fibres, otherwise than by their astringent quality, are little understood.

1100. Certain wines, especially the red and astringent kinds (1043.), are justly esteemed among the best and most efficacious corroborant remedies; and, in fact, all good wines, and other strong liquors, whether astringent or not, have evidently some corroborant power, which is perhaps to be chiefly ascribed to their stimulating quality.

1101. Other stimulant remedies also of various kinds are frequently prescribed as corroborants, and sometimes produce the best effects; nor is it at all doubtful, in what manner any stimulant remedy, by acting upon the whole nervous system, excites the muscular fibres to a more vigorous contraction, and thus, in some degree, strengthens the whole body.

1102. Some remedies, indeed, already enumerated among astringents, operate with far greater corroborating efficacy than any astringent medicines, or indeed any medicines which the patient could swallow. Of this description are—suitable exercise, cold duly applied, proper diet, and some affections of the mind.

1103. With respect to due exercise, it is above all praise as a corroborant; whether for the purpose of preserving health, if that is naturally good; or for refreshing or renewing the strength, when impaired or exhausted by disease, by a bad mode of life, or possibly by causes not so discernible; or also for the cure of numerous diseases which originate in debility, either general or partial, or of which debility at any rate forms an essential part.

1104. Exercise seems to produce it's beneficial and corroborating effect in numerous and widely different ways; especially it acts in some degree as an astringent remedy, bracing and giving density to the muscular parts, whence they acquire increased vigour. But it appears to produce still more effect, by that strength which all the muscles acquire by just, frequent, and moderate action (338.); by the assistance which it gives to the circulation (827, 8.), and all the functions depending on it; by the most salutary stimulus which it gives to the brain, the nerves, and muscles; by the excellent appetite which it usually procures, even to the most infirm; by facilitating digestion and due nutrition; by greatly favouring free perspiration, and promoting almost all the secretions and excretions; and, in a word, by rendering the mind vigorous, equable, and cheerful. Nor, while it contributes so effectually to the support of those functions, either separately or generally, is it at all doubtful that it assists the remaining functions at the same time, and of course invigorates the whole system. Again, however obscure it may seem, there is no doubt that all the muscular parts by some means participate in the vigour which some part of them have acquired; and thus, while some of the muscles of voluntary motion have, by suitable exercise, become much more vigorous than before, the rest, though little exercised, are strengthened at the same time. Nor can it be doubted, that exercise, and the steady health which it produces, are beneficial to the mind, giving it firmness, power, and cheerfulness; nor that the mind, in it's turn, when cheerful and happy, favours exceedingly many functions of the body, and is so eminently and evidently conducive to it's general vigour, that it is most justly esteemed an excellent corroborant.

1105. But among the various kinds of exercise, those are the best which, while they do not exceed the bodily strength, are most general, and in which the greatest number of muscles are employed. Thus of all exercises, walking is both the most natural, and the most salutary to persons in health, and in some cases even not ill suited to those in disease. But it agrees ill with the most part of patients, both on account of it's violence, which quickly exhausts the muscular power, and weakens the body, and of the impetus of the blood, which is too much increased by the frequent and powerful contraction of so many muscles (428.), whence inconvenience, and often no slight danger may arise in various diseases, as generally in haemorrhage, and in all disorders in which the lungs are affected, or the respiration obstructed from any cause whatever (591, &c.). For by walking and the like exercises, more blood is soon accumulated in the lungs, than in their obstructed state they are capable of transmitting; hence, in a short time, proceed fainting, palpitation, suffocation, &c.

1106. For the same reasons all the more violent exercises, as fencing, running, violent dancing, and the like, however they may agree with the healthy and robust, are seldom to be prescribed to the sick, scarcely to be permitted, and never without the greatest prudence and circumspection, that the patients may be gradually accustomed to them. With such care, indeed, very infirm persons have, in some instances, acquired an athletic vigour and strength, and become fully equal to exercises, such as at first they would not have dared so much as to attempt, and which, had they made the attempt, would have crushed them in the first effort.

1107. Fully aware of the inconvenience of the more violent exercises, practitioners usually direct their patients to the more moderate kinds, and frequently prescribe gestation for exercise; there being this difference between them, that the former is effected by a power foreign and external, and the latter by the proper and internal strength of the body. It will therefore be easily seen, how far suitable gestation is in many cases preferable to active exercise, especially in those in which very great weakness has rendered the action of the muscles difficult or too laborious, or in which either the weakness of the lungs, or impeded and imperfect respiration, renders it dangerous to quicken the circulation.

1108. But the difference between exercise and gestation is not so to be understood as if the latter admitted no action of our muscles at all. For in all some action of the muscles of necessity takes place, but very slight when compared with that which is performed in real exercise; it is also less laborious, and such as admits of being continued without lassitude or fatigue.

1109. As among exercises walking, so among gestations riding on horseback is far preferable to all the others; for no small portion of muscular action is required in it, but so slight and so varied, that it is not only tolerable but agreeable and very salutary, even to the very weak, and such as are utterly incapable of walking. Nor is it the least excellency of this mode of exercise that it forwards the circulation, in a very slight degree indeed, does not quicken the pulse too much, or throw so much blood into the lungs as could oppress them, or could render the respiration laborious or difficult. It is also of some consequence that in riding on horseback not only the body is exercised in a moderate degree, but the mind too is occupied and without irksomeness; for such a degree of attention is required to direct or repress the motion of the horse, as slightly rouses it and withdraws it, perhaps without the patient's consciousness, from those usual cares, studies, or thoughts, which would in many cases be greatly injurious.

1110. But to the patient who is neither equal to any exercise, nor to this best mode of gestation, a more easy mode must be prescribed, and especially gestation in a carriage, the effect and use of which will be readily understood from what has been just now said of riding, and which has in fact been often extremely useful. Gestation of this kind has this great convenience, that by means of it very weakly persons may attempt some degree of exercise, and even perform considerable journies with ease and safety, though in stormy weather.

1111. Besides all these, sailing, as being the slightest species of gestation, and most accommodated to the weakest patients, has been very much recommended by many practitioners, and those of no mean celebrity: and there is no doubt that this, by some mode of operation, however obscure, has produced surprising effects in favour of some patients when their case had become nearly desperate. It is a decided advantage and excellency of this mode of gestation, that it does not oppress even the very weakest, and, if there be occasion, it may be continued day and night for many days or whole months. It is by some alleged that the nausea which it usually produces has sometimes been attended with excellent effects; and many are also of opinion that the sea air which is respired during a voyage is not without it's advantages.

1112. In short, in all exercises and gestations which we wish to prescribe as corroborant remedies, we must above all things observe that they be so accommodated to the strength of the patient, both in respect of their violence and nature, and of their time or continuation, that they neither induce much sweat nor any great feeling of fatigue. For to whatever extent exercise may benefit the body and strengthen the muscles, it is most certain that, when excessive, it proves greatly injurious even to the most healthy and robust, but much more to the sick and infirm, whose bodies it exhausts, impairing their strength in a surprising degree, even sometimes inducing new and severe diseases. It will in general be a sufficiently decisive evidence that valetudinary persons have taken as much exercise as will do them good, when some degree of lassitude steals on, the body becomes warm, the forehead wet with sweat, which also begins to flow slightly over the whole skin. But it is necessary to stop and rest a little before the sweat becomes copious or the fatigue so severe as would greatly debilitate the muscles, and indeed the whole system (340.). These directions are to be most carefully observed by beginners; for, by slow steps, persons ever so weak and valetudinary often advance so far that they are fully adequate to the most violent exertions, and exercise and sweat themselves in the palestra and under a burning sun, without feeling any inconvenience from such labour. It is evident, however, that this must not be attempted by all.

1113. In fine, every exercise and gestation ought to take place under the open sky, in a pure, dry, and cool air. For good air (1033, &c.), is itself justly classed among the most efficacious corroborants; also a dry and cool air increases and preserves the strength of the body, and checks the sweat during exercise. But there is nothing to prevent exercise even under a burning sun, and with much sweat being allowed or even enjoined, when the strength or constitution of the patient, or nature of the disease with which he is attacked, seem to require it.

1114. Lastly, when there remains no capacity either for exercise or gestation, recourse must then be had to friction, which either dry, as with the flesh brush, flannel, or warm hand, or with oils or medicated vapours, to gratify the desire of the patients, becomes a corroborant remedy by no means contemptible. It seems to assist the muscular power, it certainly aids the circulation (427, 8.), greatly promotes the action of the absorbent vessels (438), encourages perspiration, and of course procures general vigour to the body.

1115. Cold also is justly classed among the very best corroborant remedies, as it's effects are sufficiently marked and evident, though the reason of them is very obscure.

1116. It seems to prove in some degree beneficial first as an astringent, but still more by it's effects on the nervous system. It is not very eligible to engage in a discussion on a subject so obscure and difficult as the action of heat or cold, and the mode in which they produce so many astonishing and important effects on the system. And indeed mysteries of that kind are of far less interest for medical purposes than the knowledge of the fact and reality of the changes themselves which they effect on the body.

1117. But the human body has in itself a certain appropriate degree of heat, which it generally preserves with little variation, although the temperature of the external surrounding air be very fluctuating (573.). There are, however, certain bounds, beyond which we can bear neither heat nor cold without injury, at the same time these are not so narrow, but that our bodies can be either hotter or colder than usual. There will therefore be some degree or point of external heat so corresponding and accommodated to our internal faculty of generating heat (572.), that, while the former exists, the latter is sufficient for repairing, in the most accurate manner possible, the loss of warmth, and of course we become neither warmer nor colder. It is also evident that this point cannot be so definite and fixed as to exclude some variation, according to a person's clothing, or the exercise which he uses; of which the latter decidedly gives intensity and increase to the faculty of generating heat, and the former, though it do not generate heat, yet preserves and retains that which is generated, not permitting it to be so easily dissipated through the air as otherwise it would be.—Farther, it is probable that habit, which has such power in other things, has some influence in this also; and that men may be so accustomed, and, as it were accommodated to various degrees of heat, that different persons may with ease endure those degrees, which would produce excessive heat or cold in others not accustomed to them.

1118. But whatever be that degree of heat which is so accommodated to persons slightly clothed and at rest, that the body retains it's proper warmth, the increase or diminution of the former affects the latter in various and nearly opposite ways. For greater heat increases the sensibility and irritability, but at the same time diminishes the strength (371, &c.), so that at length every exercise, even the most gentle, becomes difficult and laborious; and severe labour, though tolerable under a cold atmosphere, is almost impossible, or, if attempted, terminates in extreme debility, in syncope, or perhaps in sudden death. Nor does such infirmity affect the muscles of voluntary motion only, but quite pervades all the muscular fibres. But cold, that is, less heat, applied within certain limits, and these narrow enough, has an opposite effect, in some degree diminishing the sensibility and irritability, at the same time increasing the vigour, and strengthening the muscles, it renders every exercise easy, and labour supportable. Nor does this happen only in the large muscles of voluntary motion, but, in some measure, in all.

1119. Hence it will be readily understood that moderate cold, cool air, for instance, will sometimes prove a corroborant remedy of no small moment in various diseases, both chronic and acute, especially in those cases, by no means uncommon, in which the morbid debility appears to have had it's origin or aggravation in too much heat.

1120. Neither is cool air, whether applied to the whole surface of the body, or taken into tho lungs by breathing, the only substance which has such corroborant virtue, and which is prescribed with this intention; cold water also possesses a similar property, but often in a much higher degree, and is deservedly much used and esteemed.

1121. Particularly cold water taken for drink, or any weak and cold drink taken into the stomach, may produce it's salutary effects, both by it's corroborating and cooling property: and is in fact not unfrequently beneficial in various diseases, acute and chronic. It seems probable also that the powers and use of cold, applied in this way, are not yet sufficiently known and investigated.

1122. But the use of the cold bath is more frequently prescribed as a corroborant, and with greater benefit; and the very salutary effects in numerous diseases are now so well known, that no medical man can doubt concerning them.

1123. But cold applied to the body, or received into the stomach by means of water, has this advantage in point of efficacy over cold air, that the heat of the body is much more promptly carried off by a substance so much more dense, and therefore all the effects of cold, whether good or bad, are more quickly and powerfully induced. On which account, whenever the cold bath is to be used, we must employ the utmost caution that it be not too cold, and that the patient do not remain too long in it, otherwise he may acquire weakness instead of strength (1118.); for it has been long well ascertained, by too extensive experience of both the sick and the healthy, that cold, if it be very intense, or, though of less intensity, if long continued, debilitates the body in an astonishing degree, and often induces tremors, sometimes palsy, or even death itself. In like manner, the same caution is to be used with cold drink, for on some occasions it seems to produce debility, and in no small degree proves noxious (1027.); in fact there have been instances of persons, who, though sound and even robust, have suddenly dropped down lifeless, in a short time after a large draught of cold drink.

1124. But no point or degree of cold can be defined, adapted to all who ought to use the cold bath, since this must vary in different persons, and in the same person at different times; it depends also on the constitution, the nature of the disease, and on the present condition and habit of the several patients.

1125. It deserves however to be noticed, that the cold is not in excess or too long continued, which is attended with a very short tremor only of the limbs, quickly followed with a ruddy glow, moisture, or at any rate softness of the skin, vigour of the muscles, a good appetite and digestion, and flow of spirits. On the contrary the cold is in excess, or at least has been too long applied, which is followed by great and lasting tremor of the limbs, paleness of the face and skin, coldness, dryness, and weakness of the limbs, low spirits, and stomach disordered by nausea or want of appetite.

1126. Through these inconveniences (1125.) also, it often happens, that when patients first try the cold bath, of the usual temperature, suppose fifty degrees, they are not able to bear it; in this case, a little warm water mixed with the cold water of the bath, will render it tolerable, and by the practice even of a few days (1117.), by gradually withdrawing the supply of warm water, they will become capable of using the very coldest bath, not only without inconvenience or danger, but with manifest advantage.

1127. It is probable that the cold bath is beneficial as a corroborant, at least in some measure, by giving a violent shock to the whole system, such as is felt by plunging into a cold fish-pond, which powerfully stimulates the sanguiferous vessels, and along with them excites the heart itself to vigorous motion; whence the circulation is promoted, and the perspiration encouraged, with an attendant train of benefits.

1128. Such being the case, it is sufficiently evident that the cold bath will be most useful to those who stay but a short time in the water, but who do not swim in it, but either plunge headlong into it once only, or repeat it again and again as their strength will bear; for in this way all the good will be obtained which can be expected from a stimulus of such a degree of cold, and it's sedative and weakening power will not have an opportunity of injuring the body.

1129. With respect to diet, there is no occasion for many words, to evince that proper food, seasonably taken and well digested, strengthens the human body above all other things. Such is the structure and constitution which our bodies have from nature, that by their own actions, whether voluntary, or those that are involuntary, and absolutely necessary to retain life itself, they are in a short time exhausted and weakened, and generally speaking, neither is there any other remedy suggested by nature for such debility, than good and nutritive food, nor is any other requisite. Also on many occasions, when, by long abstinence, severe labour, more violent disease, whether acute or chronic, or by great evacuations, the system is beyond measure exhausted, and reduced to the greatest and most dangerous debility, in a very short time it is completely recovered, solely by means of suitable food; and in such a state, other remedies, at least all corroborating medicines, however good and efficacious, are of little or no use. Besides, it is sufficiently ascertained by the experience of athletics, that by a certain kind of diet men may acquire a strength preternaturally great, scarcely credible, and inclining to morbid, which it is not likely that the most powerful corroborating medicines would ever have effected, though the mode of living had in every other respect been entirely the same. But that vigour and strength of body which athletics acquire, is so dependant on it's fulness, and the seasonable supply of aliment, that if this be withheld for two or three days from the most active pugilist, his arms are unbraced, his strength undermined, and with difficulty dragging his limbs after him, he is not only not equal to the ring, but not even to the slightest bodily exercise, or to the common functions of life. But what sort of diet ought to be prescribed as a corroborant to patients exhausted and debilitated, will be evident from what is already stated (975, &c.), especially if we recollect, that the body is most of all strengthened by that kind of food which at the same time affords the greatest portion of nourishment and firmness to the solids, especially the muscles, and fills the vessels with a rich and dense blood.

1130. As good provision, taken in sufficient quantity, and well digested, conduces to the vigour and strength of the system, so for a like reason, certain others of our functions may in various ways conduce to the same effect, since there are none of them which are not necessary, or at least useful to health, and consequently to vigour, and in general none can be injured or impeded without quickly impairing in a greater or less degree the strength of the body. Here, however, it shall suffice to mention one of these, if indeed it can be called a function, which, next to a supply of suitable aliment is most necessary to strength of body, perhaps even little less necessary than nourishment itself, and which being impeded, wastes the muscular power in a surprising manner ; this is sleep, succeeding watching by just intervals. For during the waking period, though life should not be very full of action, the strength is exhausted in no great length of time, as the most healthy and robust may readily experience in themselves ; but in the sick, who are already enfeebled, long watching is so injurious, and so debilitates the body, that nothing can exceed it ; and unless in a very rare instance, sleep refreshes and strengthens the same persons in a manner unexpected and scarcely credible. It must also be considered, that the strength, perhaps previously shaken, is during sleep renewed, and in healthy persons as it were restored ; as also that the great waste which long watching would have produced, does not take place, so that in diseases, sleep may prove beneficial in two different ways, by preserving the remains of strength, and repairing what had been lost and gone. Wherefore it will occasion less surprise, that various remedies, which in several diseases, in different ways invite and procure sleep, should in some degree perhaps very remarkably conduce to the vigour of the system, although their immediate and general effect is to weaken it ; such are certain emollient and relaxing remedies, several evacuations, and in short, a class of medicines called narcotics, as opium, and the like.

1131. In fine, some of the passions (345.) possess so great corroborative efficacy, that they deserve to be classed with the most excellent remedies of this class ;

and indeed it is matter of the deepest regret that the regimen and management of them is so little in our hands, that even when we have the utmost need of such auxiliaries, we seldom have it in our power to excite at pleasure, or apply as remedies the passions most suited to the purpose.

1132. All the elevating passions decidedly possess some power as corroborants, and from some of them, persons very infirm, and in reality paralytic, have in some instances acquired an unusual and almost incredible strength. It is also well known, that many affections of that description, repair and increase the powers of all the muscles, voluntary and involuntary, in a prompt and very efficacious manner.

1133. But as to the more vehement of these rousing passions, such as violent anger, or sudden and uncontrolable joy, although they instantly furnish great power to our muscles, yet this very power, so suddenly induced, is usually exhausted in a short time, and is often succeeded by surprising debility and languor, which injures the system much more than a vigour so fleeting, could compensate. Therefore, unless in certain cases, and these extremely rare indeed, of very great and lasting debility, which can be removed by no other means, it is neither becoming nor allowable, to try so ambiguous a remedy, though cases are assiduously reported, in which violent and sudden passions proved a remedy for very severe diseases, and such as are commonly accounted incurable.

1134. But slighter emotions of that kind, such as joy not too sudden or vehement, hope and good humour, always produce the best effects in repairing the strength, and consequently duly promoting and assisting all the functions of the body; and neither leave any debility behind them, nor injure the system in any way. But as it is very seldom in the power of the practitioner to give cheerfulness to the sad, hope to the unhappy, and joy to the wretched, it becomes necessary to attempt those things which most approximate to them, and are more in our power, and as far as in us lies to afford relief and comfort to the calamities and sorrows of our patients, by confirming and cheering them: for instance, when despairing of their safety, exhorting them to be of good courage, and not to entertain such gloomy apprehensions about themselves. For there are few instances of patients who are not the better for being cheered with such hope and confidence, however vain, and of being kept in ignorance of the magnitude and danger of the disease under which they labour; and still fewer of patients who have not been injured by knowing all the danger of their situation. Indeed, the instances are unquestionably not rare in which sick persons have recovered from various, and even very severe diseases, by means of such ignorance, hope, and confidence, while no medicines or other remedies have been employed, or at least no benefit derived from them. Nor indeed is there any other way of accounting for many cures which are industriously published, accounted little less than miraculous, and ascribed to certain secret and unknown remedies, which, as soon as their composition is detected, not unfrequently lose their former excellencies, are found in many cases useless, and in some noxious; so that it is not at all credible that ever they had benefited the sick, however beneficial the hope and confidence in them might have been.

1135. It is not always in our power to procure or preserve to the sick, good humour and cheerfulness, much less hope and joy. But the nearest approximation, is a suitable occupation and exercise, which depends much more on us, and which produces similar good effects on the body, and in fact generally renders the mind itself satisfied and cheerful. Therefore, we ought above all things to press on the most part of the sick and infirm, especially those afflicted with diseases of the nervous system, such as dyspepsia, hysteria, hypochondriasis, melancholy, &c. such exercise both of mind and body as may not waste the powers of either. For it is not enough that the body be duly exercised, if the mind dwells with anxiety on it's cares, griefs, and solicitudes. For, whoever fixes his mind with undue eagerness on himself and his health, will either find or fancy that he is afflicted with some distemper, or, in fact, will by and by produce it. Wherefore, some business which may engage the mind is necessary for the most of patients, not only when they cannot or will not exercise their bodies, but even at the very time when they are exercising them in the very best manner, as in walking, riding, &c. On this there is no occasion to enlarge, as every one who has the least acquaintance with human nature may distinctly see that any exercise, such as daily walking, or a long journey, will be far more profitable to the man, who by a predilection for hunting, or the study of plants, is led to traverse the fields, the mountains, the woods, and the shores, unwearied from morning to evening, delighted and exhilarated by the beautiful view and admirable order of nature, than it can be to the gloomy and wretched patient, who has nothing else before his eye or in his thoughts, than the disease with which he is affected, and the danger and death which he apprehends to be at hand.

1136. But when, through very great weakness, or other causes, exercise is not at all practicable, then it becomes the more necessary to provide suitable employment for the mind, which may in some measure serve the purpose of the other. For, often when the most salutary medicines have little or no effect in restoring the shattered powers, pleasant reading, or perhaps studies not so light, exhibitions, plays, or cheerful convivial meetings, prove excellent remedies. It is, however, improper to trust to such occupations alone, seeing they commonly lose their attractive power more quickly than more serious business, and also take a less firm hold of the mind. Farther, even in those very rare cases, in which weighty cares, and business not duly intermitted or varied, have equally weakened body and mind, though it be necessary to relieve the patient from so great a burden, yet mere idleness is improper, and it is better to substitute a variety of business, lighter and more agreeable, in the place of that which had proved injurious.

1137. From what has been said concerning the corroborating powers of every kind of exercise of body and mind, and of the pleasing affections, it will be readily understood what portion of the benefit which many patients suppose they have received from various medicinal waters, the air of certain places, a long journey, or sea bathing, ought to be ascribed to the bodily exercise, or mental occupation and enjoyment from so many new and agreeable objects, and almost perpetual convivial parties, which especially tend to steal away the gloomy and melancholic from themselves. For many, even of the most celebrated medicinal waters, contain but a small portion of any medicine, and the medicines which they do contain, might be given with safety in much greater quantity than in those waters, but in this way are generally given in vain.

1138. Lastly, though sometimes debility is so pure and simple a disorder, that no other previous or simpler disease whence it might originate seems to be present in the system, and thus corroborant remedies are justly reckoned among the most simple; yet, in fact, it is in a much greater number of instances not the first or primary disorder, but depends on some other prior, and possibly simpler disease. Hence there are generally as many corroborants or medicines for debility, as there are of the more simple diseases and other causes which produce it. This indeed so far holds true, that not only astringent, nutritive, and stimulant remedies, exercise, cold, and the rousing passions, counteract debility; but in some cases certain remedies, which in their common, and, as it were, natural effect, tend very much to weaken the body. Thus, when by superabundance of blood, or violent fever, the whole system is languid and debilitated, the practitioner would blunder exceedingly who should attempt to restore the strength by nourishing food, wine, and Peruvian bark, which would all increase the debility. In such a state, the simplest diet, rest, blood-letting, and other evacuations, are the proper remedy.

1139. Upon the whole then, it appears that nature itself bestows and preserves the vigour and strength of the human body, by the various functions which it discharges. Men, again, pursuing as closely as possible the steps of nature, by very abundant and nourishing food, and frequent and vigorous exercise, may greatly increase their strength. This, however, conduces little to any medical purpose, for the strength thus preternaturally increased, can scarcely be other than morbid; and such a condition of the body paves the way for many diseases. But if the strength fail, we may in some cases correct that disorder, by certain remedies, the powers of which are but imperfectly understood; but we are more frequently under the necessity of attending to the more remote causes of such a disorder, and, to the utmost of our power, obviating them by suitable remedies, duly accommodated to each.

CHAP. XXIX.

Of debilitating remedies.

1140. Those remedies are denominated debilitating, which diminish the powers of the muscular fibres, and of course deprive their action of part of it's force. It is sufficiently certain and manifest, that many things possess such a power over the human body, and to enumerate these among remedies, and often apply them as such, is neither so useless or absurd, as at first view might be supposed; because, as has been already explained (375, &c.), vigour itself, when excessive, and therefore morbid, may also be on some occasions very dangerous. There will, therefore, be sometimes occasion for such remedies as are suited to correct that disorder, and to debilitate in some degree the muscular fibres, when too vigorous, and thus reduce them to their sound and natural state.

1141. Remedies of this description, are by some denominated atonics, as if they possessed no other advantage than that of diminishing the tension or tone of the moving fibres. But for the reasons already assigned (1093.), this name, implying an opinion not well ascertained, ought rather to be avoided, and a name imposed on these remedies expressive of their general, certain, and manifest effect. For though the greater part, and indeed the most efficacious of debilitating remedies, evidently have such an effect, yet not a few of them seem to produce that effect by other widely different modes of operation.

1142. But excessive or morbid vigour may take place either in the large muscles of voluntary motion, or in the minute fibres of the parts which are not subject to the controul of the will.

1143. As to the former, their vigour, though really morbid, does little injury, and indeed being attended with little danger or inconvenience, scarcely requires a remedy. It therefore deserves the attention and care of practitioners, in so far as it may evidently point out a more serious and less understood disorder affecting the nervous system, as in phrenitis, or insanity, of which diseases it is sometimes a part and symptom, but not at all the cause.

1144. With respect to the too vigorous contraction of the muscular fibres of involuntary motion, suppose of the heart and arteries, the disorder is much more frequent and of greater importance; being not only a part and symptom of many diseases, but also the cause of some, and is itself not unattended with it's own peculiar and indeed serious inconvenience and danger, and therefore often requires powerful and efficacious remedies.

1145. But because excess of vigour or too violent contraction in either kind of muscles, may proceed from various causes, as excessive tension of the fibres, perhaps also from too great firmness, unusual stimulus, irritating causes applied to the body, or such a state of of the brain and nerves, as though little known unless by it's effects, sometimes happens in cases of madness,—it is evident that numerous and very different medicines and other remedies, will have a weakening effect. First of all then, all emollient remedies, fomentations, warm bath, heat, rest, &c. of which enough has been already said, prove also debilitating, and with few exceptions weaken the action of the moving fibres, whatever may have been the cause of their preternatural intensity, through the obvious connection between the mechanical and vital properties of the muscles.

1146. Farther, the remedies called narcotics, namely opium and the like, often moderate and check the action of the muscular fibres, by diminishing the sensibility, and irritability of the system, and thus as it were, defending it from the force of many irritating causes, which would otherwise produce a violent action of the muscles, either in whole or in part. Also, for a like reason, by avoiding, or, if they cannot be altogether avoided, by diminishing the principal, or all the irritations which excite the body, a great deal is often gained in weakening muscular action, when at any time preternaturally excited. But we will have an opportunity afterwards, of treating more largely of this method of management, and also of narcotic remedies and their effects.

1147. Of all the weakening remedies, however, the most efficacious and most adapted to common use are the various evacuations, especially when copious or frequently repeated, particularly blood-letting, smart purging, frequent vomiting, profuse sweat, perhaps also an abundant excretion of urine or saliva.

1148. But it will be necessary afterwards to treat particularly of the various effects of every kind of evacuation. It will therefore be sufficient just now to remark, that the various evacuations have a very great effect in weakening the body, not only by abstracting much fluid from the blood-vessels, and thus at the same time taking away, or at least abating their tension and vigour, and that of the other muscles, but also some of them, in a manner entirely different, directly affect the nervous system, and often weaken it very much; because in these a portion of fluid is withdrawn, not by mere art externally applied, but is expelled from the body by violent or irregular action of certain internal parts. But such irregular, or, at any rate, violent action of the intestines, of the stomach, of the blood-vessels, or of those that contribute to perspiration, being excited by art, weakens in a surprising manner the muscular fibres of those parts: and partly through the general sympathy by which all parts of the body are united, partly through the retardation or entire obstruction of certain functions, the whole system soon participates in such debility.

1149. A diet more slender and sparing than usual, and sometimes in an urgent case total abstinence, is also often prescribed as a debilitating remedy, and that with great benefit. Nor is the reason by any means obscure why all the muscles of the body, alike of voluntary and involuntary motion, are speedily weakened by such diet or abstinence, inasmuch as, by exhausting, and in great part, dissipating the fluids which give fulness, tension, and vigour to the blood-vessels, and indeed to all the muscles, the energy of the brain and nerves is of course impaired, which greatly depends on the tension and action of the arteries and the motion of the blood; perhaps the muscles themselves are also not a little debilitated through defect of nourishment.

1150. Cold also, which was lately and not undeservedly enumerated among corroborants, may be sometimes applied as a debilitating remedy, and with no small effect, that is, when sufficiently intense, or applied for a due length of time. But the weakening effect of cold seems to depend partly on it's sedative power (of which we shall treat more particularly afterward), by which the sensibility and irritability are so diminished that numerous stimuli, which would otherwise greatly affect the body, and excite the most violent muscular action (1145), have little or no effect: and partly by a different action on the brain, the nerves, and muscles, which, even in the most healthy and robust, occasions in a short time a remarkable debility, tremor, and palsy.

1151. Such weakening remedies (1145, &c.) may be applied with ease and safety, and with much advantage in various diseases in which there is too powerful a contraction of the muscular fibres, as in insanity, ardent fevers, or inflammations. In these diseases, indeed, they give a decided opposition to the first origin of the disorder, and become therefore either it's sole, or at least it's most efficacious remedies. And in insanity itself, though the morbid vigour which is present is the effect of the disease, not it's cause, it is nevertheless worthy of remark, that the same remedies are often very beneficial: so that it is not improbable, though the reason of it be very obscure, that they are opposed to that unknown state of the brain and nerves, on which that extraordinary vigour, like all the other symptoms of the disease, depends.

1152. There yet remain some things which produce such a debilitating effect on the human body, that they may sometimes be usefully applied as remedies: as violent exercise, severe and protracted labour, and depressing passions.

1153. As to severe and long continued exercise, it's effects in weakening all the muscles of the body is sufficiently known and ascertained; but there are many things which preclude the use of such a remedy in ardent fevers, inflammations, and the like diseases, though it has been sometimes tried in insanity, and, according to report, in not a few cases with the best effects.

1154. The depressing passions, however, though their debilitating powers are neither small nor doubtful, are with the greatest difficulty applied as remedies, and indeed it is very seldom if ever allowable to make trial of a remedy so ambiguous. They certainly could never be of service to persons confined to bed in acute diseases. Some, however, imagine that deranged patients at times derive much benefit from that sadness which usually attends solitary confinement and close restraint, perhaps in a dark cell, and from the terror inspired by the care and sometimes the cruelty of the keeper, by fetters, or by the scourge. This matter is not so decisively settled but that we may be permitted to suspect that such experiments and such affections of mind have done much more harm than good, even to the most furious patients. It will not therefore be proper rashly to have recourse to so equivocal a remedy.

CHAP. XXX.

Of stimulant remedies.

1155. THOSE are called stimulant remedies which excite sensation in the sentient parts, or motion in the muscular parts. The greater part of stimulant remedies, but not all, are equally attended with either effect; for these two properties of the nerves and muscles, though of a different nature, are very closely connected, so that what excites sensation in the one produces contraction in the other. Again, intense feeling, whatever be it's cause, has often some stimulant power, and excites the muscular parts to new and vigorous motions. The conclusion, however, must not be hastily drawn, that no motion can be excited in muscular parts by stimulant remedies unless these have previously effected some sensation.

1156. It is sufficiently certain and evident that numerous medicines and other remedies possess such a stimulating property: and it is no less known that other remedies and other medicines produce a quite contrary effect, and not only do not stimulate the system,or produce sense or motion, but blunt and allay all feeling, repress motion, and, in a word, affect the body in such a manner, that afterwards, while their effect lasts, it is more slowly excited by true stimulant remedies.

1157. But though no facts can be better ascertained than these, the explanation of them is very obscure and difficult. First, because there are many medicines and other things, if not entirely of the same nature, at any rate very similar, which produce effects altogether opposite; while there are many others which, though of a very different nature, produce the same or at least very similar effects. But the greatest difficulty and obscurity about the matter lies in this, that the magnitude of the effect of such remedies by no means corresponds to the magnitude of the cause; so that the increase of the latter does not always insure the proportionate increase of the former. The circumstances are so far otherwise, that if we increase the dose considerably, the first, and, as it were, natural effect of the remedy, either stimulant or sedative, quickly terminates, and passes, as it were, into the very opposite; and farther, according to the many various and widely different circumstances of the body, especially of the nervous system, both in different persons, and in the same persons at different periods, the action of these remedies is often either impeded or disturbed in a surprising degree; so that effects are not unfrequently seen to attend them entirely different from those that are their usual, and, of course, are accounted their natural and proper effects.

1158. Hence those who are fond of debate have a fine opportunity of discussion, of philosophizing, as it is called, and of establishing numberless doctrines, very ingenious, but entirely inapplicable to every medical purpose, concerning the qualities and action of stimulants and sedative remedies; contending that their primary and natural effect is always most simple and uniform, and that the various changes which we see in the human body from the use of these, proceed, not from the different effects of the remedies on the system, but from it's action on itself, or, as some speak, it's re-action, by it's own inherent and salutary powers, of which we have long since treated sufficiently (65, 70, 364, 69.).

1159. Thus some persuade themselves that there is, and can be, no remedy really stimulant in itself, which, on being applied to the body, should immediately, and, by it's primary action, excite sensation and motion; and that all the remedies which seem to stimulate, produce that rather by their sedative power, which hurts and debilitates the body: and that this at last, by it's own salutary powers, resists such debility, speedily overcomes it, and sometimes induces an opposite state. While others are of opinion, for a reason nearly similar, and of almost equal weight, if indeed such logomachy can be called reasoning, that many of the remedies usually accounted sedative, are, by their nature and primary action on the body, stimulants; and that they become sedatives only through the excess of their stimulating power and effect, or through some power still less understood.

1160. It were certainly unnecessary to dispute about such theories, which not only have no reference to any medical purpose, and though ever so true, could never contribute to any such purpose, but which do not even by any means solve the difficulty which proves so puzzling to many. For unless they mean to contend that there is some voluntary efficacy in those salutary powers of the body, which no sound person can believe, there is nothing at all gained; for the same difficulty returns, and always will return, as long as effects so different are observed to proceed from the same remedies. It makes no difference whether one or a thousand steps are interposed between the remedy applied to the body, and the ultimate and manifest effect that is discerned in it; since whatever be the number of the steps, every one of them must be accounted the effect of that which preceded it, and the cause of that which follows,—so that the same reason which renders the connexion of the first and next step sure and steady, renders the continuation and chain of the whole fixed and immutable. Besides, neither by these, nor by any other theories hitherto proposed, is any explanation given, or plausible conjecture advanced, concerning the manner in which the foresaid remedies affect the body, whatever be their primary action. And certainly the practitioner has no interest in knowing this primary, obscure, and almost undiscoverable action of remedies, if such there be, which is so slight and fleeting, that it can do little good or evil,—but in knowing the ultimate, powerful, evident, and lasting effect, in which their use and efficacy evidently consist,—and in knowing the reason why they produce this useful effect, or salutary change on the system. But, although such theories, about these and many other remedies, are unworthy of the attention of the physician, or indeed of any man of sound reason,—it is both becoming and necessary to use the utmost care and diligence in guarding against a philosophy so vain and fallacious, which exceedingly corrupts our science, contains nothing profitable, tends to no utility, but draws off the minds of medical persons, especially students, from other matters of serious importance, such as are both capable and deserving of being understood. Let none then rashly confide in those maxims concerning the order of nature, and laws of philosophising, in which some who think themselves philosophers attempt to entrench themselves; since some of these rules are vague and futile, others even utterly false; some perhaps are in a certain sense true and useful, but neither so general as some persons believe, nor so certain and fixed as to be assumed for truths in opposition to experience.

1161. It is by no means proper for a medical man, whose leaning must be to experience and sound reasoning, to entangle himself with maxims of this kind, which many have continually in their mouth, and which they hold for fixed and immutable principles: "That "the same cause always produces the same effect;" "that the same or similar effects always proceed from "the same or like causes;" "that the magnitude of "the effect is always proportioned to the magnitude of "the cause," &c. For, of these maxims, the two latter are most evidently false and futile, and the first is so vague and general, that though, in a sound sense, it is very true, yet being rashly adopted, it may lead to the most serious errors. It is not true that the same cause produces always the same effect, for this depends greatly on the condition of the subject to which a certain cause is applied; and also on many things, which, at first view, might seem to contribute little or nothing to the manifest effect. But these various conditions we are often incapable of understanding, of foreseeing, or of ascertaining their existence. It is probable, if not certain, and the principle and foundation of all natural science, that the course and order of nature is uniform and unalterable, and, therefore, that the same cause always produces the same effect, provided it be itself entirely the same, and other circumstances exactly similar; if not, then in medicine, as in all other departments, very different effects may sometimes be found proceeding from a cause apparently the same; which, in fact, is no matter of surprise, for this is not the complete cause, but a part only of the cause of the change that follows. It is most certain, that the same, or at any rate, very similar effects, often proceed from causes very different, sometimes quite opposite; and so far from the magnitude of the effect always corresponding in proportion to the magnitude of the cause, that from a greater cause the effect frequently is less, sometimes new, and sometimes even opposite to what is usual.

1162. Abandoning, therefore, such intricate questions about a matter so obscure and useless as the manner in which stimulant remedies produce their effect on the body, it will be more to the purpose to give our attention to the effects which they evidently produce.

1163. It is to be observed then, in the first place, that many things, both medicines and other remedies, possess a power so evidently stimulating, that being applied either to a sound and entire body, or to any muscle already separated, which has not yet lost it's vitality or contractile power, they instantly excite some contraction in the parts which they touch. Likewise, the same remedies being applied to the nerve which is distributed on any muscle, excite the latter to motion (112, &c.); and some of them, applied neither to the muscle nor to it's nerve, but merely acting on the brain, affect in a similar way, the most, or perhaps the whole of the muscles of the body. Such matters, from what would appear to be their primary action, deserve to be accounted stimulants, though, when given in too large doses, or applied to a body in unusual circumstances, they may seem to possess an opposite power, and to repress and allay sense and motion.

1164. There are, besides, other substances, of which it is the nature and common effect to blunt feeling and repress motion, or which, at least when applied to any muscle, appear bland, and destitute of all stimulus and acrimony; yet these, however difficult it may be to account for the fact, in not a few cases excite new and lively motions.

1165. In fine, there are other things of an ambiguous, and as it were, a mixed nature, possessing a double efficacy as stimulants and sedatives; whence proceed sometimes various, surprising, and almost opposite effects, the one succeeding the other, either immediately, or at very short intervals.

1166. But of real stimulant remedies (1163.), these are nearly the effects: some degree of sensation, at one time slighter, at another keener, according to the power of the remedy and the time during which it is applied, in the part which the stimulus touches, and this, and often the contiguous parts, or perhaps the whole system, become more sensible than they had previously been;—also some motion of the muscular fibres, not only of the larger, which may possibly be affected by any stimulus applied to them or to the contiguous parts, but likewise of the most minute, as in the arteries or secreting organs, which are necessarily affected whenever a stimulating remedy is applied; whence is an increased impetus of the blood toward the part stimulated, a less supply indeed to the rest of the system, but more abundant to that part, redness, heat, often tumour, pain, sometimes also, real inflammation, and the secretion or excretion by it exceedingly increased or disturbed. Nor are the effects confined to the parts stimulated or those contiguous to them: frequently very remote parts, connected with the former by sympathy, are incited to violent motions,—and sometimes, by means of that general sympathy (356, 357.), of which we have already treated in it's proper place, the whole body, participating in a short time in the affection of particular parts, is very manifestly excited; and consequently all parts, both stimulated and others, often acquire renewed alacrity, vigour and mobility, and not unfrequently the mind itself a new and remarkable cheerfulness.

1167. But all stimulants are not equally capable of giving such general impulse to the whole system through the medium of a particular part: nor indeed have all parts of the body such sympathy and intercourse with the whole frame, that any affection of them should be speedily or easily communicated to the rest.

1168. Therefore, some stimulants may be said to be more, and others less diffusible; also the effects of some are found to be more lasting, and of others more temporary: but all have this fault, that the excitement which they produce, is generally too evanescent, and, what is worse, often terminates in the opposite effect; so that the most agreeable alacrity, mobility, and vigour of body, and the happy cheerfulness of mind, which certain stimulating remedies usually produce, quickly give place to an obvious languor, debility, dulness, and sadness.

1169. Hence it will be very readily understood why so many real stimulants are in common use in the service of luxury; for what reason they become grateful, and sometimes useful, even to persons in health; by what means they become, through frequent use and long confirmed habit, at once noxious and necessary to persons habituated to them; what industry should be employed to guard against such a habit and inconvenience; and what care and prudence is requisite for breaking off with safety such a depraved habit when become inveterate.

1170. As to the various parts of the body which, when affected by stimulants, communicate more promptly or slowly their effects to the others, scarcely any part possessing sensibility and irritability can be much affected, without the whole nervous system, and, of course, the whole body being in some measure affected, and participating in the same condition. But the more sensibility and irritability any part possesses, the more readily will it both receive and communicate the effects of such remedies to the rest of the body. Thus many remedies applied to the nares or skin, in which the nerves are very numerous, and the feeling most acute, to the muscles themselves, the blood-vessels, or certain secreting organs, not only stimulate these parts, but the whole body at the same time. But no part of the body possesses a more prompt or general consent with the nervous system, and of course with the whole body, than the stomach, and therefore none is more fitted for the application of the various stimulants which we wish to operate on the whole body than this organ, on account of the numerous nerves with which it is furnished, it's singular irritability, and that uncommon consent which it seems to have with the brain. Sometimes too, when through a difficulty of swallowing or other causes, suitable remedies can with difficulty be received into the stomach or retained in it, the same remedies have been attended with the best effects when thrown into the intestines by the anus: because these, as well as the stomach, are abundantly furnished with nerves, are exceedingly irritable, and have great sympathy with the whole nervous system.

1171. It is also asserted that in many instances stimulants have been used with great advantage, not in contact with the parts affected, nor so administered as to affect the whole body alike, but applied near the origin of the nerves of the affected parts, as to the neck and between the shoulders, when the arms were affected, or to the loins and os sacrum when the disease was in the legs or bladder. Sometimes also, according to the testimony of a celebrated author, when from sympathy there arises disorder in some parts remote from the seat of the disease, as in the arms and legs in the Colica Pictonum, the stimulants must be applied to the parts primarily affected, or as near as possible ; in which case they will produce their beneficial effects, though, if applied to the parts suffering by consent, they would have little or no effect.

1172. From the various effects already enumerated (1166), of stimulant remedies on the human body, it is clear that they will sometimes be beneficial in diseases, and consequently will be often prescribed by medical men for various purposes.

1173. First, then, they are often employed, and not unfrequently with the greatest advantage, for stimulating certain parts naturally sentient but rendered torpid by disease; or for restoring, and, as it were, exciting the sensibility of the whole body, when at any time it has become preternaturally defective,—as in general Anaesthesia, the stupor of any limb (1734), or that blindness which proceeds, not from faults of the humours of the eye, but from the diminution or total loss of the sensibility of the nerve, and which is termed Amaurosis (256.). Sometimes while their structure remains entire and untouched, the sentient power of the nerves evidently fails, owing to causes very obscure or utterly unknown; which nevertheless are not so fixed or powerful, but, by the help of a proper stimulus applied to the very delicate extremities of the nerves, either these causes themselves may be completely removed, or at any rate the feeling return to the nerves. But it is matter of the deepest regret that this is not uniformly the case, and that in frequent instances sensation fails or is utterly lost,—from causes so powerful and fixed, such as some compression, or injury of the structure of the brain and nerves, that, neither while these causes are present, can sensation be duly renovated in the parts affected—by these or any remedies, nor can the causes themselves be removed by stimulants applied to the nerves.

1174. Farther, with a view to renew or repair the irritability of the muscular fibres, which is often impaired, both in the voluntary and involuntary muscles, as in palsy, whether general or partial, stimulant remedies used with prudence, and persisted in for a sufficient length of time, are often of great use, and sometimes completely remove the disease. But it is too well known that this is not uniformly the case, a circumstance not at all surprising, since palsy, like defective sensation, so often proceeds from causes, either entirely fixed and incurable, or which at any rate can in no degree be removed by stimulant remedies.

1175. But, though there be no palsy, either general or partial, the actions of many parts, in whole or in part, performed by the motion of the muscles, become languid or quite defective, attended with no small inconvenience and danger. Such a disorder frequently proceeds, either from some torpor of the part itself, or from defect of the usual and natural stimulus; consequently is most properly and effectually corrected by stimulant remedies, particularly such as, by their general effect, somewhat excite the whole system, and furnish some degree of irritability even to the most torpid parts; and which, when applied to these parts, supply the place of the natural stimulus, which, from some cause or other, had failed.

1176. In this manner, by the due use of stimulant remedies, we may promote and restore almost all the secretions and excretions when deficient, or excite and increase them at pleasure. Also, for a like reason, proper stimulants applied to certain parts produce motions in them, new and not at all natural, but often necessary and very salutary. On this foundation rests the administration of many evacuants, such as excite vomiting, purging, urine, sweat, or saliva, &c. It is sufficient, however, to have mentioned these things here, as they must be particularly treated of afterward.

1177. For a similar reason too, remedies of this kind are frequently, and with the greatest advantage, prescribed for changing, and, in some measure, directing the course of the blood, when preternaturally determined toward certain parts—a disorder neither rare nor slight. But the action of the arteries of any part, being excited by the power of stimulant remedies, a greater quantity of blood is necessarily determined to that part, and therefore a less proportion is conveyed to others. In many morbid affections this furnishes a sudden alleviation, so great and lasting, that, were it not so manifest, it would exceed all expectation and belief.

1178. Farther, stimulant remedies are often found extremely useful, sometimes absolutely necessary, in great debility of the muscular parts, especially of those, the actions of which depend not on our will, but are absolutely necessary to the preservation of life and health, as the heart, arteries, and stomach. There are, indeed, stimulant remedies which so vigorously excite, recruit, and increase the powers of the heart and arteries, that, by the consent of almost all physicians, they have not undeservedly acquired a separate and peculiar name, being termed cordials. Also many stimulant medicines are commonly prescribed, and often with decided and lasting benefit, for exciting and increasing, if defective, the powers and action of the stomach. These are consequently by many called stomachics. These classes of stimulants, cordials and stomachics, and indeed many others, become corroborants also (1100, 1.): nor will it be a surprise to any one that their effects in increasing the strength of the muscles, should in some cases endure a considerable time; if he shall duly consider—how close the connexion is which subsists between the various functions of the body, how admirably all conduce to the support of the general vigour, and how promptly the benefit which some parts derive from proper stimulants is communicated to the rest.

1179. Such also is the power of certain stimulating remedies, and such the connexion and sympathy between the various parts and functions of the system, that by those remedies life may be restored anew, when almost extinguished: and it is beyond doubt that many who were so near expiring, that, if left to themselves, they would never have revived, have, by means of proper remedies of a stimulant description, been snatched from the jaws of death, and restored to life: and that many more would have enjoyed the like benefit, had the remedies been applied with due promptitude and perseverance.

1180. On account of their effects in exciting or increasing arterial action, stimulants are frequently and not improperly prescribed for removing obstructions, which frequently take place in various parts, especially in the organs of secretion (751.), and injure the whole body by obstructing the function of the part affected, or terminate in other severer diseases. It is rather a matter of regret than of astonishment, that the best and most efficacious of those remedies are not always effectual against such obstructions, though on some occasions they operate with astonishing effect.

1181. Some of them were formerly believed to be very beneficial in attenuating various of the fluids, when preternaturally thickened and propelled with difficulty. But such a disorder, especially in the blood, is a much rarer occurrence than medical writers imagined. And although it is certain that stimulants are of no small benefit in many diseases which were supposed to depend on that disorder, yet a different and more probable account may be given of their good effect. There is no doubt, indeed, that certain secreted fluids sometimes acquire a preternatural thickness, and this fault is in some cases corrected by this class of remedies; the reason of this fact is by no means obscure.

1182. Farther, it appears that some of them, partly owing to their stimulating quality, partly, and perhaps chiefly, to some other medicinal virtues which they possess along with it, are extremely useful for correcting or preventing putrescency of the system (535, 38), whether general or partial: although, by heating the body, the greater part of them evidently favour putrescency, apparently often inducing or increasing it.

1183. Many remedies most evidently stimulating, frequently operate with no small force against those irregular motions called spasms, sometimes preventing them when approaching, sometimes removing them when present; and consequently are not undeservedly enumerated among antispasmodic remedies, though these in fact belong to another class, that of sedatives. They seem to have this effect partly by their power as corroborants, diminishing the irritability of the system; partly by giving it a more powerful stimulus, which overcomes the feeling or action of the former and impedes it's effect; partly, perhaps, by changing the course of the blood, and, along with it, the flux of the nervous energy; these, by the action of the stimulus, being drawn aside from the parts formerly affected to others.

1184. Lastly, in consequence of their effects on the mind itself, which they so greatly refresh and exhilarate, certain stimulants, especially cordials, sometimes become eligible when the mind is listless, languid, sad, and the spirits sunk without any reasonable moral cause. But in this case the utmost prudence and caution is necessary; for, however certain their good and exhilarating effect, it is quite fleeting, and often noxious in no small degree, leaving the mind more listless and gloomy, and the body more languid than before. Nor is there a more frequent or certain cause of such a morbid condition, both of mind and body, than the abuse of the very things which, if prudently used, would have in some measure proved a remedy.

1185. The remedies which, when duly employed, may be subservient to so many important purposes, are in vast abundance and great variety: but a particular enumeration of all stimulant remedies in this place were quite superfluous; it will be sufficient to notice the principal kinds.

1186. In the first place, then, with respect to stimulant medicines, the greatest differences among them refer to their origin as derived from the animal, the vegetable, or mineral kingdoms.

1187. The qualities of the various stimulant medicines, are also very much diversified; so that while some operate on the body with such acrimony, that when taken into it even in the smallest quantity, they produce the most violent effects, and are indeed never unattended with some danger; others are so safe and mild, that they may without danger be administered even to the most delicate, and effect nothing, either good or bad, unless when taken in large doses.

1188. Almost all those substances which seem acrid and pungent to the taste, and also many which have either no acrimony, or very little, and that scarcely discernible, serve to stimulate some one or other portion of the muscles; for all stimuli are far from having an equal effect on all muscles (318.).

1189. Hence it will be readily understood, that the most part, or perhaps all salts, pure, neutral, earthy, or metallic, possess some stimulant quality, provided they be properly administered: such, for example, is the case with soda, ammonia, sulphuric and muriatic acids, muriate of soda, sulphate of soda, carbonate of ammonia, sulphate of potass, muriate of mercury, red oxide of mercury by nitric acid, yellow sub-sulphate of mercury, tartrite of antimony, and sulphates of zinc, of copper, of iron, of magnesia, and of alumina, &c. Nor are these things less truly stimulant, that many of them on some occasions produce an opposite effect, and prove excellent sedàtive remedies, according to the way in which they are used and administered, and the various circumstances of the body, or of it's several parts.

1190. The vegetables also, which are accounted acrid, possess a discernible stimulant power. Of these there are many kinds or families, as they are called: and first, the siliquose and the cruciform, as they are named by various authors,—examples of which we have in the white mustard, horse-raddish, scurvy-grass, water-cress, &c.; squill too, and the whole alliaceous tribe, as leek, onion, garlic, &c.; also the umbelliferous plants, as carraway seeds, angelica, fennel, &c.; and many other acrid plants which cannot easily be referred to any common genus or family, such as the ranunculus sceleratus, nettle, arum, asarum, colchicum autumnale, tobacco, digitalis, ipecacuanha, convolvulus jalapa, rhubarb, rhamnus catharticus, black hellebore, mezereon, and a vast number of others, which prove either general or partial stimulants. The property in many of these plants does not reside in all their parts, but in the roots, the leaves, or the seeds.

1191. Aromatic vegetables also, a very numerous family, without exception possess some stimulant quality, and some of them are stimulants equally powerful and grateful. Examples of these are all kinds of pepper, the common, the white, and the long; pimento, cinnamon, canella alba, laurus cassia, cloves, nutmegs, mace, Winter's bark, ginger, &c. to which must be added certain milder aromatic plants, such as our colder climates produce in abundance, as common mint, peppermint, penny royal, thyme, savine, lavender, rosemary, and the like. But, though the stimulant powers of all the aromatic plants be discovered in various parts of them, it depends almost entirely on their peculiar, and, as it is called, essential oil, which may be drawn off by distillation; and therefore, wherever this is most abundant, there the stimulating power will chiefly be found.

1192. Therefore, the distilled waters of those medicines, whether weak or spirituous, as of peppermint or cinnamon, or of nutmegs, operate on the human body with the same power as the medicines whence they are extracted; but often prove much more agreeable, and better accommodated to medical use. For they contain, in solution, a considerable quantity of aromatic oil, in which the stimulant power chiefly resides (1191.); although this oil, being diluted with a great quantity of water, or other fluid, however pungent by nature, becomes so mild, that it may be drunk with ease and safety.

1193. In short, the aromatic oils themselves, unmixed, being extracted by distillation, become very powerful stimulant remedies, but are generally so hot and acrid, that they are disagreeable to the patients.

1194. Those medicines called balsams or resins, differ little in their nature from the volatile oils, as the balsams of Copaiva, Canada, Peru, and Tolu, and the various turpentines, &c.

1195. After these must be noticed a very numerous class of stimulant medicines usually termed gumresins, being the peculiar juices of certain vegetables inspissated, which they either yield spontaneously, or afford more largely when punctures or incisions are made in them at a proper season. Take as a specimen, assafoetida, gum ammoniac, galbanum, or sagapenum, gamboge, aloe, &c., which are often prescribed either as a general or partial stimulus.

1196. All bitter plants, though in other respects mild enough, have somewhat stimulating in them, sufficient at any rate to affect certain of the more delicate and irritable parts of the system, or perhaps to excite them to new and unusual actions. Thus the leaves of the carduus benedictus, flowers of camomile, or root of gentian, or even light infusions of them being drunk more abundantly or sparingly, stimulate the stomach to more powerful action, or excite vomiting. Next to this kind of bitter medicines, bile, though an animal product, must be noticed, which seems to possess equal bitterness and a similar stimulant power, but is seldom prescribed as a medicine.

1197. In fine, every kind of wine, whether prepared from grapes, from apples, or other fruits, all ales and fermented liquors, and still more those strong liquors, drawn off these by fire, called distilled spirits, prove to the body a very sure stimulus, grateful, often salutary, and sufficiently durable. This is evident in almost every kind of debility and languor, whether proceeding from excessive labour, great evacuation, depressing passions, long abstinence, protracted disease, or severe fever of a more malignant character: and wherever there is occasion for an internal and general stimulus, remedies of that description are now prescribed by practitioners much more largely than formerly, and with decided benefit to the patient.

1198. Very few stimulant medicines are derived from animal substances (1186.). Cantharides, indeed, possess great power as a stimulus; but on account of their excessive acrimony, they are but rarely, sparingly, and with extreme caution prescribed to be taken inwardly. Externally applied to the skin in the form of a plaster or ointment, they are commonly attended with no danger; in this manner they are daily prescribed, and partly by their stimulus, partly by their other effects, which yet are manifestly dependent on that primary one, they are of the greatest advantage in various diseases. Perhaps the Millepedes too, which were formerly so highly esteemed, should be classed under this head; for their medicinal virtues, if indeed they have any, seem to be of a stimulant character; but these are neither so certain, nor of such importance as to deserve the attention of practitioners, who are furnished with so many other and more efficacious remedies of that class.

1199. But besides the stimulant medicines, there are some other remedies which produce considerable stimulant effects, and which are in some diseases employed for this purpose.

1200. Among these, the first notice is due to that extremely subtle and active agent, which has for some years past been so well known to philosophers and medical men, by the name of the electric fluid, and which pervades many bodies in an astonishing manner, affecting them in different ways, either by the extreme rapidity of it's motion, or in some other way not understood. But it not only pervades the bodies of animals with inconceivable velocity, but at the same time proves a very powerful stimulus, exciting sensation in the sentient, and motion in the muscular parts, with such celerity and certainty, that nothing can exceed it.—Even when coming in contact with any muscle cut out of the body, which consequently can have no feeling, but retaining still it's contractile power, it will instantly excite that muscle to contraction, though now torpid and insensible to every other stimulus. Nay, so great is the stimulant power of this fluid, that when too abundantly applied even to a sound and vigorous body, it instantly extinguishes life itself. Some ascribe this destructive effect solely to the excessive intensity of it's stimulant power; others think that it ought to be referred to the sudden and great debility which commonly succeeds an excessive stimulus. For it is evident, from an inspection of the bodies of those who have been killed in this manner, that no evident laesion could be discovered which would be supposed the cause of death. But when more sparingly and cautiously used, it is not at all dangerous, and stimulates most powerfully, either the whole body, or the parts to which it is chiefly applied; and thus it is frequently employed with the happiest results in palsy, amaurosis, and amenorrhoea; for it stimulates to motion the minute fibres of the arteries, as well as the large muscles of the body and limbs, and thus removes obstruction, and gives intensity to the impetus of the blood.

1201. This most excellent remedy is usually applied to the body in one of two ways, by sparks or by shocks. Between the two there seems to be little or no difference, except that the former are milder and more easily borne, the latter more severe, and consequently less suited to the delicate and feeble,—and from the pain and extreme uneasiness which they produce, do not admit of being daily repeated for the length of time requisite to cure some diseases in which they seem to be useful. For it must be observed, that this remedy, though very powerful, has often little effect, unless when administered abundantly, and long continued; and therefore it is with a bad grace that some practitioners complain of it's inefficacy, who made but a slight trial of it for a few days. There have not been wanting instances of patients recovering completely by the use of this remedy alone, although for some months, and with a very free use of it they had received little benefit. The administration of such a remedy can scarcely be defined or regulated by number or measure. It deserves however, to be known, that moderate shocks, to the number of three hundred or more in a quarter of an hour, or numerous, rather numberless sparks have been daily employed for a long time, not only without injury, but with eminent benefit. But it must not be understood as if so active a remedy were always proper, or never attended with danger, even in those diseases which seem to stand in the greatest need of some stimulus, as in apoplexy or palsy, &c. ; for it has often done hurt, and therefore must always be administered with prudence, or sometimes entirely prohibited,—when there is much fever, a superabundance, irregular distribution or congestion of blood, or very great debility; lest it either increase former disorders, or produce new ones perhaps still more dangerous.

1202. The same caution is necessary with respect to heat, which, of all the stimuli hitherto known, seems the most universal and efficacious ; which not only excites to contraction the muscles of an animal yet fresh and irritable, but rouses the languid, the torpid, and almost lifeless to motion and life ; which to many animals proves a second source of animation, speedily bringing forward to actual life, the egg which otherwise would never have lived ; which to all animals is necessary for stimulating their several parts adapted to their proper offices, especially the brain, and the nerves and muscles which are dependent on it ; which, in fine, has such dominion over the human body, that, being augmented, it increases the sensibility and irritability to an astonishing degree, and being diminished, diminishes them to torpor and palsy.

1203. It is therefore no matter of surprise, that on some occasions heat has been applied as a stimulant in some diseases, and with the best effects. For a slight addition to the usual heat proves a slight stimulus, such as is frequently safe and useful for the body ; a greater degree of it affords a more powerful stimulus, both to the nervous and the sanguiferous systems, and of course to the whole body ; a violent heat also, such as takes place during the burning of any part, gives a stimulus vehement and insupportable, not only to the part burnt, but even to the whole system. But though such a stimulus is on some occasions not without it's advantage, there is no occasion for discussion to shew that it is very little accommodated to ordinary medical use. Even a much slighter heat, such as may be endured not only without pain, but without much uneasiness, or which might even be agreeable to many patients, is attended with several serious inconveniences, and therefore cannot be always administered as a stimulant; first, because by it's effects on the whole nervous system, it renders the general mobility excessive; also, because it gives too great intensity to the impetus of the blood, which is often very dangerous; because it greatly relaxes and unbraces the skin, and indeed the whole system, and thus often produces more debility than it's stimulus can compensate; because, in fine, it greatly favours the putrescency of the fluids, than which nothing can be more pernicious to the body.

1204. After heat, the next place belongs to cold, which, according to the purpose for which it is applied, may sometimes be a very powerful stimulus, though, when administered in a different manner, it becomes a most efficacious sedative, as will be more fully explained in it's proper place.

1205. Cold proves a stimulus to the body, only when in a proper degree of intensity it is suddenly applied for a short time, as when one plunges into cold water, an application which is said to have cured some paralytic patients when persisted in for a sufficient length of time; or cold water, drunk when a syncope seemed approaching, which often prevents the disorder; or when the face of one who has already fainted is sprinkled with cold water, which often revives the strength and motions of the body. Sudden cold is therefore not undeservedly classed among stimulants, perhaps partly on account of the vehement sensation which it produces, for every sensation of a more violent description is a stimulus to the system; partly too on account of it's peculiar power of affecting the muscles, even without sensation, as when it is suddenly applied to the heart already cut out of the body of a cold-blooded animal. But long continued cold, though when not intense it is a corroborant of no small importance, yet does not stimulate the body at all, but has rather a sedative effect, diminishing sensation, and repressing all the motions.

1206. Exercise also, for an evident reason, imparts to the body a considerable stimulus, in some diseases extremely useful, and far preferable to every other stimulus known. This is eminently the case, when, from various causes, the circulation becomes preternaturally languid (469.), and certain functions depending on it, become at the same time deficient, especially secretion and excretion by the skin (729.), and sometimes that by the kidneys. Nor are instances wanting in which, after such disorder had so far advanced, that a dropsy (472.) was evidently threatening, or had already been induced, and of consequence the general health was in the utmost danger,—the circulation being duly quickened (427, 8, 9.) by the stimulus of suitable and frequent exercise, the dropsy has been expelled, and the patient quite recovered. On this too, at least in a great measure, depends that benefit so marked, and, if any thing can be affirmed with certainty concerning the powers of remedies, decided and uniform, which many patients labouring under chronic diseases have found in moderate exercise (1103, &c.).

1207. But it is not solely by quickening the circulation that exercise stimulates either the whole system, or particular parts or functions, but it also gives a stimulus to the whole body by it's effects on the nervous system, which, though less understood indeed, are not less certain; and thus it is sometimes of the greatest advantage in some diseases which depend on causes quite different from the more languid state of the circulation, such as torpor or palsy, more or less complete. Perhaps the very contraction of the muscles is a stimulus to the system, and that unknown power or effort (327.) which excites to action the muscles of voluntary motion, has a still more evident effect in stimulating it. For every sensation, many of the passions (1243, 14.), and, in short, every act of the will, produce some excitement in the body, greater and more decided in proportion to their vehemence.

1208. Though this stimulus which exercise gives the body be often very salutary, yet it is not unfrequently attended with great inconvenience and danger, and of course does not equally agree with all patients who stand in need of stimuli; because in some cases, while it greatly excites the body, it exhausts the strength exceedingly, and, as it were, crushes the patient, a matter easy to be discerned in those that are very weak; for it must always be recollected, that exercise becomes a more violent stimulus, and brings with it the greater inconvenience or danger, the weaker the patient has become, whether by nature or disease. This is not at all surprising, when, besides it's debilitating effect on the nervous system (340.), it quickens the circulation to such a degree, and thus imposes on the sanguiferous system, a new and additional labour to which it is inadequate. To those, therefore, who are enfeebled and exhausted, this stimulant must be prescribed with extreme caution. But it will suffice to have noticed here, these hints on the good and bad effects of exercise, since they were more largely treated of already under another head (cap. XXVIII.).

1209. With respect to feeling, every sensation is attended with some degree of stimulus, which, if it reach a certain strength, would be sufficient to prevent (396.) or interrupt sleep, or to excite motion in various parts of the body. But different sensations produce more or less excitement, according to their force, which depends on the preceding or present state of the body, on habit (143.), and on many other circumstances. Thus while many sensations are so feeble as scarcely or not at all to prevent sleep, more violent sensations, or severe pain (182.), not only produce excitement, but exceedingly disorder and convulse the body. Farther, some sensations, by no means of a violent nature, as those arising from light, noise, moderate warmth, which would have little effect on a person in sound health, prove powerful stimulants in different circumstances of the body, as in fevers, hysteria, in puerperal or very irritable patients. In such instances indeed, they are decidedly noxious, but in others, where there is some lethargic or torpid affection, they are of great advantage.

1210. Again, the affections of the mind, not all alike indeed, but those which, for distinction's sake, are called exciting or elevating (345.), as anger, joy, hope, hilarity, &c. possess a greater and more decided stimulant power; which, as was already noticed in it's proper place (346.), sometimes does hurt by it's violence, but is often of admirable use by it's general and very grateful stimulus. Of a tendency somewhat akin to these, is that moderate exercise of mind, which is duly accomodated to the constitution and genius of the individual. But it is not necessary to discuss the subject here at greater length, the most general and necessary directions pertaining to it having been already given elsewhere (1131.).

CHAP. XXXI.

Of sedative remedies.

1211. Remedies which diminish sensation and repress motion, are called Sedatives.

1212. It is beyond a doubt, that numerous medicines and other remedies, not only of a different but of a quite opposite nature, in different ways operate on the human body with a power of this description; although it is very difficult to explain by what means many of them produce such effects, especially since other very similar medicines, or even the same administered in a different time and manner (1157.), prove decidedly stimulating.

1213. In the same way as stimulants, sedative remedies have their primary and chief effect on those parts of the body to which they are immediately applied; but in many cases, if they are properly administered, other parts sufficiently remote, or even the whole system, participate in some degree in the same effect.

1214. Various causes often render remedies of this kind necessary in different diseases, both general and partial. But all sedatives are not equally suited to every disease which requires such aid; as they differ, not only in the magnitude and degrees of their common effect, but also vary much in the other effects which they produce on the human body.

1215. In various diseases, according to their causes and the condition of the body, very different and almost innumerable medicines may lessen and allay sensation and motion, and thus, in some sense, become sedatives. In as much as every motion (and the same is the case with sensation,) depends on a variety of circumstances; chiefly on some certain condition of the brain, the nerves, and muscular fibres, fitting them for being acted upon in a particular manner by certain causes, as for instance, various stimuli; it depends also on the nature and force of the stimulus applied. The motions, therefore, which are excited, will correspond in some proportion to these several causes taken together. Thus, the pulse of the arteries is often too strong or too frequent, owing to causes widely different; such as excessive tension of the arteries, excessive or general mobility, great debility, or a violent stimulus applied to the whole body, by means of great heat or heating medicines. It is therefore plain, that sometimes all relaxing remedies, as various evacuations, or emollient medicines,—sometimes again astringents and corroborants; in some cases exercise, in others rest; at one time heat, at another cold; now opium, then aromatics or wine; will, in such a state, have a sedative effect. But supposing the condition of the brain, nerves, and moving fibres with which the arteries are furnished have not undergone the smallest change, the various conditions of the stimulus itself, as the superabundance, excessive acrimony, or too great force of the blood, brought on perhaps by violent exercise, may render the pulse too strong or too frequent; in such case, indeed, blood-letting, diluents, demulcents, antiseptics, &c. will produce a sedative effect. For a similar reason, many pains, many irregular motions, fever, diarrhoea, vomiting, convulsion, and inflammation, often proceed from very different causes, and are sometimes suppressed by remedies equally different; yet all these, if we only advert to their ultimate effect, may be called sedatives.

1216. But omitting all those which seem to prove sedative by means of some other more proper and simple effect, we shall in this place treat only of those which, by their primary and simplest action on the human body, whether this be distinctly seen and ascertained or not, allay and repress the present sensation and motion; and, while their effect lasts, render the body less disposed to sensation and motion for the future.

1217. There is no small supply of the medicines which produce this effect: but the best and most efficacious of them may be reduced to two heads, narcotics and refrigerants, which differ not a little indeed, not only in the magnitude, but also in the nature of their qualities.

1218. Narcotics, particularly such as opium, henbane, hemlock, &c. are much more powerful and certain than refrigerants, but, on different accounts, are believed to be less adapted to many diseases.

1219. Of a narcotic remedy, particularly opium, which is, perhaps, the best of them all, and the most employed, when taken in moderate quantity, these are the effects; a certain placid rest and tranquillity, both of body and mind, a slight hebetude of all the senses external and internal, with stupor, and sopor very like natural sleep; the pulse generally slower and fuller, the breathing softer, the temperature lower, the bowels costive, the stomach weaker, and the appetite diminished, sometimes not without nausea; almost all the secretions and excretions very much diminished, except sweat, which seems to be somewhat increased, the texture of the skin being relaxed, partly through it's sympathy with the stomach, partly through the tranquillity and quiet sleep which opium usually procures,—whence the bowels become more costive, and the other secretions and excretions diminished. But sometimes, even in persons in health, or affected with slight illness, and much more frequently in the case of those who suffer great pain or severe fever, especially if too small a dose of opium has been taken, instead of a quiet sleep, the rest is disturbed with horrific dreams, or perhaps no slight delirium without sleep. These effects, indeed, are observed from a moderate or small dose of opium; but from a greater or excessive dose, there proceeds often a violent nausea, then vomiting, and unless, by this means, the medicine be ejected, there is induced, in a short time, a deep sleep, which can scarcely be interrupted, and will quickly terminate in convulsions and death.

1220. Opium is also observed to have other effects in some persons, according to their constitution, and the various conditions of the system when that medicine is administered.

1221. In many cases it seems also to prove hurtful through the dread the patients have of it, and repugnance to take it, under the apprehension that it is very noxious and dangerous. On this account it is sometimes both allowable and necessary to deceive them, and, without their knowledge, administer to them a remedy, not only safe and efficacious, but very salutary, perhaps absolutely necessary.

1222. On many occasions too it injures the patient very much, and, instead of quiet and salutary slumbers, such as might recruit their strength, produces an unsound and imperfect sleep, terrific with horrible dreams, or sometimes, without any sleep, a considerable delirium (297.). This takes place in those patients who appear to have the greatest occasion for such a remedy, and to whom it has been administered in too small a dose: and there is not the least doubt, however the use of a medicine, which approaches so near to a poison, may appear dangerous, that, in general, patients have sustained more injury and inconvenience from too small than from too large a dose. It is, therefore, the duty of the practitioner to use the utmost caution and prudence in the administration of a medicine so powerful, and in many cases pernicious; to have recourse to it in those diseases only which evidently require something of the kind, but, when such necessity urges, he must prescribe the remedy freely and with confidence; for then he may not only hope, but almost promise, that by his medicine, he shall accomplish the salutary effect desired. But if it is given in a timid and too sparing manner, it will have a far different effect, and will much injure the very patient, whom it would have highly benefited if it had been administered in larger quantity.

1223. From other truly narcotic remedies, such as henbane, hemlock, or woody-nightshade, other different effects frequently proceed; particularly great vertigo, headach, weight on the head and eyes, and sometimes a sense of straitness in the throat, &c. There are some of them, which, though sedatives, in some degree stimulate the intestines, and thus relax the bowels considerably; not indeed equally in all patients, but in many to whom they are administered. Therefore, it seems very probable, that some of them may not be attended with some of the serious inconveniences of opium,—such as it's costive effects on the bowels, and the great injury it thus does to the stomach, the head, and the whole body; and, therefore, these other medicines might be substituted for it with great advantage in various diseases, at least in the case of many patients.

1224. There is another kind of sedative medicines, namely, refrigerants, which affect the body in a different way from narcotics; and, though their effects are neither uncertain nor obscure, their power over the human body is far inferior to that of narcotic medicines.

1225. It cannot be doubted that refrigerant medicines, like other sedatives, first affect the nervous system: but they can scarcely, or not at all be said to blunt sensation, and induce sleep (1219.), by their primary and natural action; though sometimes they may seem to produce either of those effects, by obviating several morbid causes which produce too keen sensation or pain, or which impede sleep.

1226. They are said to operate chiefly on the circulating system, moderating the pulse; and thus, from the close connexion which subsists between the circulation and the heat of the body, they render it cooler, whence they have their name. They also quench thirst, and, in some degree, resist putrescence; both of which greatly depend on the impetus of the blood and the heat of the body.

1227. It is matter of observation and regret that the most part, if not the whole of the refrigerant medicines have much less efficacy than medical writers have supposed; and of course, however celebrated, they cannot be trusted to alone, when there is great impetus of the blood, or great heat of the body to be corrected.

1228. But the most efficacious medicines of the refrigerant description are certain salts, both acid and neutral; for all the alkaline salts, especially ammonia, have a quite opposite effect, and evidently stimulate and heat the body.

1229. Nor is it a just objection to this opinion, that almost all salts, acid and neutral, as well as alkaline, have a stimulant quality (1189.); for the most decided experience proves, that many salts of various kinds, which, being taken in large doses, commonly stimulate the stomach, intestines, and organs of secretion and excretion, being used more sparingly, have little effect on these parts, and evidently possess a sedative (1226.) and refrigerant effect. It is also often seen, that some of them, taken in such quantity as to prove a considerable stimulus to some parts, such as the intestines and kidneys, at the same time affect the other parts of the system in a very different manner; and not only do not stimulate them, but check and restrain their actions, and thus, for instance, moderate the circulation, and of course render the body cooler.

1230. But of the acid salts, though perhaps all possess some refrigerant power, the most powerful are the fossile acids. Of these again, the best is the sulphuric acid, almost the only one now employed by practitioners. When much diluted with water, or what is still much safer and better, when mixed with a portion of gum or sugar, to sheath or blunt so acrid a medicine, it may be administered with safety and freedom, and often with signal benefit. It is often of the greatest advantage too when mingled with the patient's ordinary drink, to give it an agreeable acidity. But it must be observed that this medicine is not only a powerful sedative and refrigerant, but an astringent also, a corroborant, and antiseptic; and of course the benefit derived from it is not to be wholly attributed to it's refrigerant effects alone.

1231. This also is the place for noticing that singular acid salt, called for distinction's sake, Sedative Salt.

That this should possess some power as a sedative and refrigerant, needs be no matter of either doubt or surprise; but though very much commended by some, it is not yet evident that it has any peculiar excellence, that it is preferable to other acids either fossile or vegetable, or even to some of the neutral salts.

1232. But various vegetable acids, though much weaker and milder than the sulphuric acid, possess nevertheless a considerable refrigerant power; and with this intention are frequently and freely prescribed, and found very beneficial, safe, and grateful remedies to the most of patients, whose case requires such aid.

1233. Also along with pure vegetable acids, whether native or such as have acquired their acidity by fermentation, are to be classed many esculent fruits, which though ever so ripe, always retain some acidity, together with a grateful sweetness. Such fruits become very excellent refrigerants, and on account of their mild nature, and sweet taste, are devoured in great quantities by sick persons, not only without repugnance, but with the greatest eagerness; and thus being sometimes used both as food and medicine, they prove more efficacious than much stronger medicines, which, on account of their acrimony or unpleasant taste, or the nausea or vomiting which they produce, must be administered in dozes of a few drops only, or at any rate in very small quantity.

1234. Immediately after these fruits, we may enumerate nearly all the esculent vegetables (984, &c.), and the several preparations of them, which we are in the habit of using as aliments. For aliments of this description, though when fresh they have no acidity, yet become acid in some degree during digestion in the stomach and intestines (628.); and partly by this acidity which they acquire, partly by their mild and bland nature, cool the body considerably when it is disposed to be heated either by any other means than food, or by the use of animal food in it's different forms. But of the various kinds of food, and their effects on the human body, enough has been already said in it's own place (chap. XXV.).

1235. After these are to be classed the seeds of certain vegetables, as of the melon, the cucumber, the gourd, purslane, lettuce, succory, &c. which in former times were believed to possess a great refrigerant power, whence they were termed cold seeds. If, however, they have any such quality, a point not yet fully established, their efficacy is very small, and practitioners do not trust much to them; and it must be accounted for in the same way, as the like power, which is found in so many vegetables, and the weak food and drink prepared from them (1233, 4.).

1236. As to the neutral salts (1228.), only some of them have a refrigerant quality; for many of them, like common salt, can with difficulty be used or not at all, without evidently stimulating and heating the body, increasing thirst, and forwarding putrescence. Others, however, as nitrate of potass, evidently possess a sedative and refrigerant quality. Such a striking difference between the several neutral salts has never yet been accounted for.

1237. Among the neutral salts which possess a refrigerant quality, nitre of potass is perhaps the best and most powerful medicine, and is often administered with evident advantage. But other neutral salts are not unfrequently employed with the same indication; especially such as consist of an alkali, and the acetous acid, or of the latter and ammonia, as the acetite of potass, or that mixture called the solution of acetite of ammonia. All the neutral salts which are formed of the sulphuric or acetous acids, and the various alkaline salts have a greater and more certain refrigerant quality, than those formed of the muriatic acid, and the same alkaline salts: though some are of opinion that muriate of ammonia, one of the latter, possesses such a power; and that it is of the greatest benefit in certain fevers, especially intermittents, when, on account of the great heat, and increased impetus of the blood, the usual and most efficacious corroborant and stimulant remedies appear inefficient or dangerous.

1238. This is also the place for noticing supertartrite of potass, which bears a great affinity to neutral salts. By it's sedative and refrigerant quality, which is considerable, it has often been of great use in fevers, and other diseases which require such aid; it is still more beneficial by promoting the discharge by stool and urine. Farther, the tartrite of potass, like other neutral salts already mentioned (1237.), is a good refrigerant.

1239. By the experience of practitioners, it is now sufficiently ascertained, that the sedative effects of some of the neutral salts, especially for repressing vomiting, perhaps also in cooling the body, are the greatest when they are taken in a state of effervescence. This benefit seems, in a great measure at least, to depend on the carbonic acid, extricated from the alkaline salt during effervescence; and it may be obtained with ease and safety by drinking the mixture immediately after the opposite salts are mixed together and beginning to effervesce, or by first taking the one salt pure, and drinking the other immediately after, so that the effervescence takes place only in the stomach.

1240. Perhaps next to refrigerants we ought to mention many strong scented or foetid medicines, which have been greatly celebrated formerly, and of late as sedative remedies in various diseases, and believed to be of the greatest use, especially in repressing those irregular motions of the muscular fibres which are called spasms (383, 387.); whence, by the common consent of physicians, they are called Antispasmodics.

1241. Take as instances of these, the following: castor, musk, civet, animal oil, carbonate of ammonia, all animal substances; the various petrolea or bitumens, ambergris, amber, with it's salt and oil, all drawn from fossil substances; and numerous vegetables and preparations of them, as peony, stinking orache, valerian, assafoetida, galbanum, camphor, soot, sulphuric ether, and similar ones almost innumerable.

1242. But of these and the like strong scented or foetid medicines, it must be observed, that not a few of the most powerful of them possess a manifest stimulant quality, and therefore are now deservedly classed among stimulant remedies (1188, 1197.) : and it seems probable enough that they prove antispasmodic more by their stimulant than by their sedative quality; the reason of this has been already assigned (1183.).

1243. But with regard to those which are merely odorous and foetid, and possess no stimulus, though it cannot be denied that on some occasions a few of them have been of surprising benefit, not only in obviating spasms, but various other morbid affections which require sedative remedies, as delirium, intense watching, &c. yet it must be confessed that they are in general of little efficacy, and, what is worse, cannot be depended on as certain remedies.

1244. It is a very difficult matter to explain their action, when they are observed to operate really as sedatives or antispasmodics; for they usually produce almost no simple, manifest, and uniform effect on the body (936, 940.). Their smell may contribute somewhat to their salutary effects, as it not only greatly affects the brain and the parts and functions dependent on it; but likewise very powerfully strikes the imagination, the influence of which on the nervous system is so great and so manifest, that it can be no surprise though the affections of the former exceedingly counteract many diseases of the latter. And, in fact, while the morbid conditions of the nervous system, and the numerous causes of these are almost or altogether unknown, it cannot well be expected that the action of all remedies which tend to obviate them should be understood. And if such ignorance of the action of those medicines is much to be regretted, it is certainly matter of much deeper regret, as the greatest opprobrium of medical men, that they are little better agreed about their effects and uses, than about the explanation to be given of their mode of action.

1245. Here too are to be enumerated, if indeed they deserve to occupy any place in rational therapeutics, various medicines, distinguished neither for their stimulant, nor sedative power, nor for taste, smell, or any other manifest quality, which have nevertheless been often employed, and much commended as antispasmodics; such are cinnabar or red sulphuret of mercury,—either native or factitious, ground liverwort, misletoe of the oak, oxide of zinc, unless these last be supposed to possess some degree of astringent and corroborant power (1041, 48.), and in that way be occasionally of advantage against spasms (1065.),—and many others similar, some quite absurd and ridiculous, which the superstition or ignorance of our ancestors, or the errors of modern authors have introduced, and the credulity both of practitioners and people has long retained.

1246. Though it is most certain that such medicines have no natural effect, yet if we may credit medical writers, instances have not been wanting, neither few nor dubious, in which they seemed to have very great effect; perhaps that may be accounted for in this way, that many spasmodic diseases often terminate spontaneously, perhaps never to return, or only at distant intervals; so that whatever medicine was last employed, previous to the termination of the disease, is esteemed as the remedy by the patient and his friends, perhaps also by the medical attendant, if defective in caution and discernment. Besides, many of those medicines have frequently been administered along with other more efficacious remedies, such as astringents, corroborants, or various evacuations; and, by a mistake very natural to patients, but which is not creditable, or indeed at all excusable in physicians, have been celebrated for good effects to which they had not at all contributed. Many of them too, which could have no effect on the bodies of the sick, have often had a very great effect on their mind; and how far that may influence the body, both in producing and removing diseases, this is not the place to discuss. Without doubt many have been completely cured solely by this confidence. In fine, not a few spasmodic diseases depend in a great measure on imagination, nor in fact is it rare to witness or to treat diseases entirely imaginary, in which, therefore, the most proper remedies are either quite imaginary, or at any rate have their chief effect on the imagination; for in such circumstances reason forbids to have recourse to more potent remedies, which, if they did not find a serious disorder, might produce one.

1247. Next to the various sedative medicines are to be enumerated other remedies, which are subservient to the same intention.

1248. The first of these is cold, than which nothing possesses a greater or more decided sedative power on the human body; which, if duly applied, most evidently blunts the power of sensation (143, 144.), checks all the motions, lessens the irritability (379.), and induces sopor, or a very deep sleep, which in a little time proves deadly (396.).

1249. But whereas in various places we have made so many remarks concerning cold and it's effects on the human body, it will be sufficient to notice at present, that it's sedative effects are most discernible when it is uniformly applied for a considerable time; for if it is sufficiently intense, and suddenly applied for a short time, it proves sufficiently stimulating (1205.). But applied more uniformly, and for greater length of time, it is destitute of all stimulus, and, unless too intense, is unattended with danger or inconvenience, and often becomes a most salutary and efficacious sedative remedy, very much suited to many diseases proceeding from various causes.

1250. Heat too, of the various effects of which, and of it's stimulant powers on the human body (1202), so much has been already said, is not improperly reckoned among the sedative remedies; since it is not unfrequently observed to lessen the motions and repress them when irregular, to allay pain, to blunt the sentient faculty, and, in a word, induce sleep.

1251. But such effects of heat are not to be attributed to it's primary and simple action on the system, which seems indeed to be very different and almost opposite, nor to the excess of it's stimulating power (1159.); for they very evidently depend on it's emollient and relaxing power, by which the skin particularly and the external parts, being unbraced, almost all the parts of the body, and especially the muscular fibres, both of the large limbs and of the heart and arteries, are somewhat relaxed and debilitated: whence the impetus of the blood is abated through the whole system, and of course through the brain, and the energy of the brain and nerves is much diminished, sometimes to extreme debility, or perhaps syncope. Hence it will be very easily understood that the sedative effects of heat will be the greatest when it is so regulated as to produce this emollient and relaxing effect with the greatest certainty; for instance, when it is applied along with other emollient remedies (1068, 1073.), such as warm water, steam, the various fomentations, which are often found very useful in many diseases evidently requiring a sedative remedy, as in fevers with or without delirium, inflammations, insanity, and some convulsions.

1252. Farther, some affections of the mind, such as are by medical men denominated depressing, as grief, fear, anxiety, or great solicitude, possess such a manifest and striking sedative power, that there is no room to doubt that these would be no less beneficial as sedatives, than the other kind of passions (1210.) are as stimulants, provided the regimen and administration of them were in the practitioner's power. Nor are instances wanting in which such affections, whether excited by accident or design, have produced the most salutary effect in various diseases, as intermitting fevers, insanity, epilepsy, and hysteria, &c. It is also alleged that some diseases, depending on too great mobility of the nervous system, and of course requiring some sedative remedy, happen more rarely during the tempest of civil war, or, if they had been previously prevalent, they are then almost completely removed, when the minds of men are occupied and distracted with heavy cares and solicitudes, public or private; and it is still more certain that some persons affected by such diseases, when plunged into the heaviest domestic calamities, such as might have oppressed much more vigorous persons, have sometimes recovered beyond all expectation.

1253. It must not, however, be denied, that the greater part of such instances are not quite free from some doubt and suspicion: lest we ascribe to a depressing emotion, which is manifestly present, that benefit which is derived from an entirely opposite passion, more obscure, but no less really in operation. For the hope of better times, which seldom deserts the bosoms of the unfortunate, and which is often most vigorous in adversity,—the incessant engagement of the mind, intent on great events, public or private,—and the efforts, though unsuccessful, of a brave mind conflicting with adversity, may, by a very different and more certain mode of operation, be of great benefit in many diseases.

1254. One thing yet remains, of the utmost importance among sedative remedies, which is employed by practitioners in many diseases with great solicitude and care, and frequently with eminent benefit to the sick; namely, that management or regimen, by which they guard against every stimulus and irritating cause which could unseasonably excite or heat the patient.

1255. This administration is in fact very difficult, and extends to many objects; because even the healthy, and much more the sick, are continually exposed to almost innumerable sources of irritation, many of which can by no care or study be either avoided or removed. It is likewise necessary always to recollect, that on many occasions the most minute of these things are not neglected with impunity; because the feeble and sick are sometimes exceedingly injured by many irritating causes, which would not have even the least noxious effect on a person in sound health, or which, by duly exciting the system, would rather seem to be conducive to health. For the more severe the irritation produced by the most part of stimuli on the body, the more enfeebled and irritable it becomes (1209.); which is particularly observable in the greater number of acute diseases, whether pure fevers, or also others of which fever forms a considerable part; as in various inflammations, eruptions on the skin, discharges of blood, &c. in which diseases the body becomes very weak, and is unusually irritated by the violence of the disorder, and therefore very incapable of enduring causes of irritation, however slight.

1256. Therefore, that regimen, by which we endeavour to remove, as far as possible, all irritation, is of the utmost necessity in fevers and other acute diseases, and by physicians is not improperly called the Antiphlogistic Regimen.

1257. It embraces a variety of matters very different from one another, which, for the sake of more easy and prompt recollection, may be arranged under certain heads.

1258. To begin with bodily exercise,—every species of it, sometimes even the very slightest action of the muscles of voluntary motion, is to be avoided with the utmost care; because, as was already explained (1206.), a considerable stimulus, arising from this cause, affects the whole body, and especially the sanguiferous system; not merely through the facility given to the return of the blood through the veins (425, 428.), but also by that undefinable effort by which the muscles of voluntary motion are excited to action. Wherefore it is not sufficient that those labouring under acute diseases abstain from all their usual labours and exercises; they must rest completely, and betake themselves to bed, because, when in a recumbent posture, the action of the muscles is the least possible; for in a sitting, and still more in a standing posture, a considerable action of the muscles always takes place, and is quite necessary, to such a degree as would sooner or later fatigue and oppress even those of the soundest health and greatest vigour, and would generally prove very noxious to those in fever.

1259. It is also necessary sedulously to avoid irritations proceeding from the various external and internal senses, or, if they cannot be entirely avoided, to diminish them as much as possible. It is therefore necessary to abstain from study, from business, deep thought, or conversation, which is doubly injurious by the action of the mind, and by that of the muscles, which produce voice and speech, and from all things which can much affect the mind. We must guard against too vivid light, loud noise, much heat, which is in many ways very hurtful, whether proceeding from the air, too many bed clothes, or too soft a bed; in certain diseases, against cold, which often proves either a general or partial stimulus; and against every uneasiness which may affect the sense of touch, as an inconvenient position of the body, an unequal, too hard, or ill made bed.

1260. We must also guard against that irritation, no trifling one certainly, which is usually produced by impure air impeding the respiration or perspiration, or by the dirty state of the clothes or bed clothes, retaining and anew applying to the body that corrupted and noxious matter which has been already expelled. Wherefore pure air, now and then renewed, and generally cool, is an object of the greatest utility; not only itself serving important purposes (1033, 4.), but at the same time removing a severe and very pernicious irritation; for a similar reason, it is necessary frequently to change the clothing of the sick, the bed clothes, both of linen and woollen, and the bed itself.

1261. It is necessary likewise to guard against various irritations proceeding from the functions of the stomach and intestines, and still more readily from their disorders; for the digestion of the food, though ever so healthy, stimulates the system a little, and somewhat quickens the pulse; but indigestion, such as generally takes place in acute diseases (643.), is much more stimulating, by distending, irritating, and oppressing the stomach with a load of corrupted and acrid matter, which is ready to induce anxiety, vertigo, headach, nausea, vomiting, gripes, and diarrhoea. The stomach must therefore be carefully attended to, and the food chosen, sparing, refrigerant, very thin and easy of digestion, which has already been fully treated of (983, &c.). But if the stomach, nevertheless, continue disordered and oppressed with the aliments, however slender, it's affections must be instantly obviated by diluents, demulcents, antiseptics, emetics, &c.

1262. The practitioner must also pay attention to that very troublesome thirst (649.) that usually attends the greater part of acute diseases, producing a most distressing irritation; and either remove it by proper remedies, or, if this cannot be accomplished, at any rate he should abate and quench it by diluting, acidulated, and grateful drink, abundantly supplied to the patient at pleasure.

1263. Sedulous attention must also be given to the state of the bowels, which in the greatest part of acute diseases are preternaturally costive, in many cases also constricted in a surprising degree; whence arises an incessant and most pernicious irritation, which greatly quickens the pulse, heats the body, sometimes induces or increases delirium, and partly by it's morbid heat, partly by retaining in the intestines corrupted and acrid matter which ought to have been ejected, greatly favours putrescence. The bowels therefore must be relaxed by proper diet, or the milder medicines, or frequently opened by emollient clysters.

1264. Nor is the state of the urine to be neglected, which is sometimes in small quantity or discharged with uneasiness and pain, and is, in not a few cases suppressed; whence quickly arises great irritation, and even extreme danger, for the reasons already explained (740.). These inconveniences must be obviated with the utmost speed by diluent medicines, by gentle diuretics, fomentations, or clysters; or if these have not the desired effect, the urine must be drawn off by the catheter.

1265. In fine, there are frequently other morbid irritations in the body, but differing according to the nature of the various diseases which happen to be present; such as the varying acrimony of the fluids (530, &c.), and especially, according to the common opinion, the putrescent acrimony; which must therefore be obviated by diluent, demulcent, and antiseptic remedies.

1266. Lastly, however necessary this antiphlogistic regimen may be in the most part of acute diseases, it is to be observed that there must be somewhat of a departure from it in some cases; as when more severe irritation seems to proceed from the remedy than from the disease, a circumstance which has been sometimes distinctly observed, and is not unworthy of the attention of practitioners. Thus, for instance, though lying in bed generally suits patients in fever, is agreeable to them, and often absolutely necessary, yet sometimes it is much better for one in delirium to rise and try to sit a little erect, especially when increased impetus of the blood has brought on or increased the delirium; and it has doubtless often done much hurt, and rendered the delirium in the highest degree severe, to confine the feverish, or slightly delirious patient, in bed by force. With equal reason those irritations, generally not a little injurious, which proceed from sight, hearing, or conversation, must not be absolutely prohibited, as they may in some cases diminish (293.) or entirely remove that delirium, which would be much aggravated by confining the patient in darkness, silence, and solitude. Nor in fact are instances wanting in which it is necessary to allow a flesh diet, with a little wine, to feverish patients, and even to phthisical persons wasting by slow fever; though it is very well known that such diet is, by it's stimulus, generally hurtful to persons in fever, especially in phthisis: perhaps it may be accounted for in this way, that sick persons, on account of their debility, are very much hurt (709, 755.) by many other irritations which cannot be removed, though the diet be very slender and nearly free of all stimulus: but the strength being recruited by a richer diet, duly accommodated to the circumstances of the body, the patient bears with more ease both the stimulus of the the diet and the noxious effects of those other irritating causes.

1267. Various medicines, and other remedies of a sedative kind (1215, &c.), like stimulants (1172, &c.), may operate in different ways in various kinds of diseases, and be subservient to various uses and purposes in the human body. But as it would be impossible to enumerate all their effects, or all the diseases in which they are found useful, it will be sufficient to take notice here of the principal morbid affections in which they are usually administered, whence their uses and effects in other similar affections will be readily understood.

1268. In the first place, then, by their effects on the brain, the nerves, and muscles, or the nervous system as it is termed among medical men, they become beneficial or necessary whenever this is preternaturally excited, as in mania, or merely in protracted watching. But in such disorders, besides narcotic and refrigerant medicines, many other things prove excellent sedatives, especially various evacuations, almost all the emollient and debilitating remedies, and cold applied either to the whole system or chiefly to the head; nor is even heat, when duly applied, without it's use.

1269. For reasons not widely different, wherever the system is severely irritated, especially by pain of almost every description, cough frequent or violent, tenesmus, or strangury, sedative remedies become necessary for removing or rather checking that irritation, which would otherwise prove very hurtful: and the sensibility and irritability being diminished or blunted by a proper sedative, the stimulus will lose great part of it's effect, or the whole, if the remedy applied be sufficiently powerful. In such disorders narcotic medicines are the best remedies, and are often found so necessary, that many practitioners, and these of no mean reputation, have not hesitated to avow, that they neither could nor would exercise their profession if deprived of such remedies. The most eminent and skilful know too well that it is not always in their power to remove the causes, and thus instantly and completely cure the most urgent disorders; and that it is a matter of no slight moment to steal the patient away, by proper remedies, from tortures which would perhaps be speedily mortal, and which are more terrible than death itself. But these remarks must not be so understood as if it was allowable, on every occasion of severe irritation, to neglect it's nature and cause, and to have instant recourse to narcotics, or, as they are termed, anodyne medicines. For reason dictates, what abundant experience sufficiently confirms, that the cause of the evil must be attended to whenever it can be detected, in order to correct or eradicate the disease itself with the greater ease, certainty, and safety. And indeed not a few of the most severe irritations to which the body is in various diseases obnoxious, are very salutary or even necessary for the cure of more destructive disorders. It is therefore incumbent on the practitioner to restrain or to moderate those irritations only which seem to be useless, pernicious, or excessive, and, when it is practicable, to attempt this by remedies which may remove or diminish their causes; but when these are unknown or incurable, then he will be allowed the use of anodynes.

1270. Again, it is necessary to be apprised concerning these medicines, that the more severe the irritation, the effect of them is the less, except the patients take them in larger doses; so that sometimes, in order to remove the pain of one tooth, and procure sleep to the patient, nearly ten times the quantity of opium will be requisite which would have laid the healthy man asleep.

1271. It must also be remarked that opium and similar medicines, being often repeated, in a great measure lose their efficacy by long use and habit, and have no effect unless they be taken in large quantity; the body also becomes so inured to them, that it will bear with ease and impunity an incredible dose, such as would poison a person not in the habit of taking them; also, after such a habit has been for some time confirmed, the system cannot, without difficulty and danger, be deprived of it's usual medicine (945.), so that it can only be withdrawn slowly and with caution.

1272. In fine, opium has another inconvenience, and that not a slight one, namely, that it is frequently very disagreeable to the stomach, produces nausea and vomiting, and, what is still worse, almost always (1219.) weakens the stomach in some degree, rendering the intestines torpid, and the belly, of course, very costive. These inconveniences must therefore be carefully obviated, either by joining with the opium some grateful stimulant medicine, or, if the stomach will in no way bear it, by administering the opium as a clyster: or the bowels may be gently relaxed by weak subacid diet, by a mild purgative, or, which is still better and more commonly employed, the frequent and moderate opening of the belly by suitable emollient clysters.

1273. Also on that excessive or irregular action of the muscular fibres, termed spasm, sedative remedies become beneficial through their effects on the nervous system; when employed in this state they are called Antispasmodics (1240.).

1274. As already explained (1242.), a great number of medicines and other remedies are sometimes beneficial in spasms; and indeed not only sedatives, but often stimulants, corroborants, various evacuations, and, in not a few cases, remedies the effects of which, on the human body, are otherwise very obscure and uncertain.

1275. On the various antispasmodic remedies we have a few remarks to offer. The most certain and durable benefit is to be obtained from those that powerfully counteract the cause of the disorder; such are corroborants, proper diet, and, in some cases, certain evacuations; though mere sedative remedies, as narcotics, or even stimulants, sometimes completely remove certain kinds of spasm.

1276. But narcotic remedies, and stimulants too, contribute not a little to the complete and permanent cure of many spasms, by stopping and interrupting that depraved habit, by which almost all spasms become surprisingly inveterate (386.); so that those which, in their nature and origin, were but slight, being frequently repeated, become very severe and almost incurable.

1277. When either sedative or stimulant medicines are to be administered as antispasmodics, they must be given when the disease is just at hand, or at a short interval before it's access, in cases where the return of the disorder can be known beforehand; for in this way they are most beneficial, as experience has abundantly proved. Whereas, had the same medicines been given long before the access of the disease, and long persisted in, so far from curing the disease with greater certainty and facility, by rendering the body more weak and feeble, they would frequently increase the disorder in no slight degree, as the abundant experience of many can attest.

1278. Corroborants, again, which are certainly found to be the most efficacious antispasmodics, are to be administered in a very different manner, being persisted in for a long time, and taken only during the intervals of disease, because they are of no avail after the disease has commenced; and emollients, or debilitating and other opposite remedies, and especially evacuations, are then frequently useful. Nor is there room to doubt, however surprising it may appear, that remedies which have great effect in present or immediately approaching spasms, are not of equal advantage against them when future or more remote: and those remedies which most effectually counteract the future do not remove existing spasms. The explanation of this is to be sought for in the causes which induce spasm (389, 390.).

1279. With respect, indeed, to any remaining medicines which have obtained the name of antispasmodics, though apparently possessing neither sedative, stimulant, nor corroborant power on the body, it must be acknowledged that the administration of them, like their qualities, is not yet well understood. It is alleged that some of them, as musk, castor, &c. immediately on being taken, remove present spasms, and prevent those that are just approaching; while others, as valerian, oxide of zinc, &c. have little effect, unless they have been long employed during the intervals of the disease; and some much celebrated, as lichen, &c. which are said to prevent hydrophobia, even by the confession of those who have written most in their favour, are of no avail after the disease is already formed. A more extensive experience, therefore, can alone teach us the administration of those medicines, which is hitherto very obscure and uncertain.

1280. Farther, from the effects of sedative remedies in moderating the circulation, they are often useful whenever the impetus of the blood becomes excessive; and various kinds of them are by practitioners employed with this intention, especially refrigerants (1224, 1239.): but the use of narcotics in such a state, has long been reckoned so dangerous, that the most part of practitioners have used them sparingly, and with cautious timidity. But though it is beyond a doubt that such medicines have often done much injury to the sick in ardent fevers, inflammations, and many similar diseases, it must nevertheless be observed, that it is rather from mere conjectural opinions, or indeed evident mistakes, that they have been prohibited in those diseases, than from any experience of their injurious effects. The experience also of many celebrated practitioners has sufficiently proved, that they have often proved very beneficial in various fevers, intermittent and continued, inflammations, discharges of blood, and other diseases which are attended with increased impetus of the blood; and have not only alleviated or removed pains, and such various uneasinesses as are the usual attendants of these diseases, and procured sleep to the patient who otherwise would not have slept, but have evidently abated and reduced the impetus of the blood, and of course either entirely removed the whole disease, or at least rendered it milder and more easy of cure.

1281. No judicious person indeed will deny, that the administration of them in such diseases requires much prudence and circumspection, for reasons sufficiently obvious; and every one readily understands that they will not benefit the patient equally in every stage of the disease, but must in the course of it be at one time prohibited, at another enjoined, according to the various circumstances of the patient, and the nature and degree of present symptoms. For the body is very differently affected during the access and during the decline of acute disease, and requires and bears very different remedies.

1282. In short, sedative remedies serve another purpose, and have the best effects in abating or suppressing various morbid or excessive evacuations, as diarrhoea, or diabetes, and sometimes many discharges of blood.

1283. Of these diseases, some depend entirely on the excessive or irregular action of the muscular fibres of the part whence the discharge comes; others arise partly from this, partly from the excessive and general impetus of the blood, and it's unequal distribution. It will therefore be no way difficult to assign the reason why they may be counteracted by the various classes of sedative remedies, particularly by refrigerants, narcotics, and the antiphlogistic regimen. But, on many occasions, beside those more strictly called sedative, other remedies, as astringents or corroborants, are in these diseases necessary to their complete and permanent cure; the administration of which, together with their salutary effects, have already been treated of elsewhere.

CHAP. XXXII.

Of remedies which correct the various disorders of the fluids, viz. inspissants, attenuants, demulcents, antacids, antalcalines, and antiseptics.

1284. ALTHOUGH the greater part of the theories concerning the vitiated conditions of the blood and of the other fluids of the human body, to which the more ancient physicians, Galenists, chemists, and mathematicians, were so long attached, have now become nearly obsolete, as possessing little certainty or utility,—we must not therefore conclude, either that these disorders of the fluids have no existence, or that they are so rare or slight as neither to require any remedies, nor to deserve the attention of the judicious practitioner. For our fluids are obnoxious to many peculiar disorders, neither slight nor ambiguous, very injurious to health, and not unfrequently to life itself; though it is far from being a fact, that this is the source of all the diseases which medical men were in the habit of referring to it. Of the nature, causes, symptoms, and effects of the disorders which have been supposed sometimes to affect our fluids, we have already spoken in it's proper place (524, 544.) It remains now that we give some account of the remedies which severally correct them.

1285. As a morbid thinness of the fluids, especially of the blood, is justly mentioned among their principal diseases, there will be an evident necessity for remedies which may correct that fault, and restore their just and natural thickness. Remedies of this description are not improperly denominated Inspissants.

1286. Of the medicines indeed, which produce this effect on the human body, neither is the supply scanty, nor their action difficult to explain.

1287. In the first place, all the wholesome provisions in common use, especially the most nutritive and solid, as the various kinds of flesh meat, and preparations of them, so long as the appetite and digestion are good, by affording due nourishment to the body, fill the vessels with good and massy blood, and thus prove excellent inspissants. And when the object is to inspissate the fluids, there is no need of discussion to render it evident to every one, how far a dry solid diet excels a thin watery one, even though the latter be not defective in nutrition. Therefore nearly all the farinaceous vegetables on which several nations live, might, like the flesh of the different animals, be enumerated here.

1288. But besides those things which come under the name of food, many others, for a similar reason, are by some classed with inspissant remedies, as the gluten called isinglass ; various gums of vegetables, as that of cherry trees, gum tragacanth, gum arabic, and many herbs which contain mucilage, as marsh mallow, tussilago, flax, orchis ; to which may be added mild vegetable oils, as of olives, or almonds ; every one of which affords some portion of bland and substantial nourishment, which inspissates the fluids when they are preternaturally thin, and somewhat blunts and corrects their acrimony, if any be present.

1289. But among inspissant remedies, are enumerated medicines of another description, differing entirely from those already mentioned, and which seem to produce their effects in a very different manner ; namely, many astringent, corroborant, or even stimulant medicines, such, for instance, as the inspissated juice of catechu, the grains of the kermes oak, dragon's blood, red roses, alcohol, or distilled spirit,—and the fossil acids, the sulphuric, nitrous, and muriatic.

1290. Whoever reflects on the closeness of the connection which subsists between the various functions of the human body, and between the state of the fluids and that of the solids (526.), will easily understand, that remedies of this description will be of much advantage for inspissating the fluids; since they correct certain vitiated states of the solids, and consequently of their various functions, which either permit the fluids to be too much attenuated, or, at least, are the cause of their being less easily reduced to a sound state. For although some of them have the power of inspissating, and, in fact, of coagulating the human blood, it is not at all credible that they effect this in the living body; but by invigorating the system, and promoting digestion, assimilation, and the various excretions, they are of no small use in correcting the morbid tenuity of humours.

1291. Nearly the same reasoning, and equally clear, will account for the operation of some remedies which, in inspissating our fluids, are little inferior to those already mentioned; such as frequent exercise, a copious sweat excited by art, and indeed every means by which the thin excretions are increased; while at the same time, by the sparing use of drink, or total abstinence from it, and by the use of the most solid food, the patient may guard against admitting into the vessels any undue portion of thin fluid.

1292. The opposite disorder of the blood and other fluids, namely, excessive spissitude, to which practitioners have imputed so many and so serious disorders, though in fact it seems to be of rare occurrence (528, 9.), has also it's peculiar remedies, which are properly termed attenuants or resolvents. Many authors of considerable reputation affirm, that these have often proved of great advantage in various diseases; so that it is beyond a doubt, that opinions abundantly foolish and trifling concerning the causes of certain diseases, have, in this as in not a few other instances, conducted practitioners to excellent remedies. But the reason of this must be sought in the nature of those remedies, and the various effects which they really produce in the human body; while it will be easily seen, that in several ways they will be of great benefit in various other diseases, beside the spissitude of the fluids.

1293. Diluent medicines particularly, as water, and all weak liquids, of which water forms the far greater part, being drunk in large quantity, and conveyed by the lacteals into the blood, have a very powerful effect in attenuating the fluids, when preternaturally thickened. For, by no other means than drinking such liquors in moderate quantity, can we guard against that spissitude which, in every person even in perfect health, would be quickly induced in consequence of the usual functions of life.

1294. But practitioners supposed that the diseased spissitude of the fluids might often be counteracted, not only by such thin liquors to dilute their grosser parts, or even in some measure dissolve them,—but by other additional medicines which might increase the solvent power of water, or possessed some solvent quality of their own.

1295. But though it cannot be denied that some of the attenuant medicines commonly commended, as alkaline salts, or various soaps, sometimes produce an astonishing and evidently morbid tenuity of the humours; yet it must not therefore be concluded that this new tenuity is to be ascribed to such a solvent property, and much less that all other attenuants possess a similar quality, especially as another and more probable reason may be readily assigned, both for that tenuity, and also for the effects of other remedies of the same description.

1296. For the alkaline salts greatly increase that putrescency to which our fluids are by nature sufficiently prone (*535.*): nearly the same may be said of soap, which in the human stomach, where some acidity is seldom wanting, can scarcely escape being resolved into it's elements. It seems therefore probable, that the singular tenuity of the fluids which these things produce, are to be imputed to their septic powers. Nor can it be doubted that all things which promote putrescency will at the same time produce some tenuity of the fluids, though, for various evident reasons, they may not answer as remedies.

1297. But other salts, especially the neutral, as the muriate of ammonia, sulphate of soda, sulphate of magnesia, borate of soda, nitrate of potass, supertartrite of potass, muriate of soda, or at any rate sea-water, &c. are said to possess some attenuating property, and with this indication are prescribed by some practitioners. But it may be doubted whether that attenuant property which it is alleged they possess, be derived from any solvent quality, or from a quite different source; for it is scarcely credible, that their salutary attenuant powers depend solely on that septic property which many suppose to belong to all salts when taken in small quantities.

1298. Besides, all those salts possess some stimulant power (1189.), and many other medicines, undoubtedly stimulants, are commonly classed among resolvents; as squill, garlic, white mustard, aloe, mezereon, mercury, the sulphuret of antimony, and preparations of these almost innumerable. It appears also probable enough, that these, as well as the salts just now mentioned (1297.), have often proved beneficial in various diseases, commonly imputed to spissitude of the humours,[1] by their stimulus alone, rather than by any powers septic, solvent, or in any way attenuant. For, when the circulation has, from various causes, become too languid, stimulating medicines may renew it's activity and intensity, at the same time augmenting or restoring the various secretions and excretions, when perhaps they are defective, or nearly obstructed.

1299. Farther, it will hence be very readily understood, that every kind of attenuant medicines, at least diluents and stimulants, will often be of the greatest benefit in various diseases, though no diseased spissitude of the fluids be present; as in fevers, either unmixed, or attended with inflammations, or eruptions on the skin; in many obstructions and diseases which proceed from them; or, whatever be the nature of the disease, they may be useful for facilitating the circulation and promoting the various excretions. And certainly there are many diseases, besides spissitude of the fluids, in which it will be of advantage to dilute both the aliments, and the blood itself, or to fill the vessels well with a bland and thin fluid, to cool or relax the body, or to excite urine or sweat; all which may be effected by the prudent administration of the medicines denominated attenuants.

1300. Practitioners in former times, attributed so much to various acrimonies of the fluids, frequently ill understood, that they were much in the habit of using certain medicines, such as they supposed calculated to correct, or at least diminish almost every kind of acrimony, and to defend the solid parts of our bodies from the noxious effects of too acrid fluids. Medicines of this description acquired the name of Demulcents: and it must be observed concerning them, that they have sometimes been extremely useful, however futile many of the opinions of medical men have been concerning the morbid acrimonies which they supposed to be in our fluids. For it cannot be denied, that the fluids of the human body, naturally somewhat acrid (532.), from various causes sometimes acquire a greater and noxious acrimony; and, what amounts to the same thing, the various parts through which acrid humours must pass, are sometimes disordered, and either they are deprived of their mucus which should defend them, or at least this is so depraved, that it no longer suffices for their defence.

1301. It is evident then, that in this state, all weak and bland drinks, and various oily and mucilaginous matters, will give relief. For every kind of acrimony, being much diluted, becomes weaker, and at length wholly inactive; and the most acrid substances being mixed with those that are more bland, as with mild oils, or the various gums, become so mild, that they seem almost to have laid aside their own nature. Again, the same mucilaginous or oily matters, by anointing our solids, defend them greatly against those that are acrid. And, in fact, the general demulcents of which we now speak, are nothing else than diluting, mucilaginous, and oily medicines, the use and administration of which will therefore be easily understood; it will also be evident at the same time, that they will be very beneficial, not only in a general acrimony of the fluids, but in many morbid acrimonies of the several secretions or excretions, in various diseases of the stomach and intestines, and of the parts subservient to respiration or the excretion of urine.

1302. There are, however, certain special and definite acrimonies, the characters of which are sufficiently known and thoroughly understood, and which, of course, require, and are provided with specific remedies.

1303. Among these the acid acrimony is always noticed, which, though very seldom taking place in the human blood, or even in the various secretions (541.), is nevertheless observed, neither unfrequently nor obscurely, in the stomach and intestines, and proves the origin and cause of many diseases of a serious nature. The remedies which either prevent, remove, or correct it, are properly termed Antacids.

1304. Among antacid medicines, the alkaline salts deservedly occupy the first place, together with absorbent earths, including the calcareous, as lime, chalk, coral, shells of eggs, and of various shell-fishes,—and the non-calcareous, as magnesia, the boles, or calcined bones; these substances, as chemical science teaches, and as daily experience sufficiently demonstrates, possess a special and decided property of absorbing and correcting all acidity.

1305. But these several substances possess their common quality in very different degrees; thus the alkaline salts, calcareous earths, and magnesia, are found to be very powerful medicines, so that the rest are almost neglected.

1306. These (1305.) also differ not a little, not only in the strength of their antacid powers, but as to other effects which they produce on the human body. Particularly the alkaline salts are often inconvenient for being administered, on account of their great stimulating quality, for, if too large a dose be taken, they are almost sure to harm. But the absorbent earths being of a character sufficiently mild, are much more adapted to common use; nor can they do much harm though the dose should prove larger than is requisite to correct the acidity. These also differ considerably, so that at one time calcareous earth, and at another magnesia, is the more appropriate medicine; for if there be any degree of acidity, the latter has considerable efficacy in relaxing the bowels; while the former, on the contrary, often constipates the bowels that were previously relaxed. Either effect is sometimes found in excess, so that some prudence is requisite in administering these earths.

1307. Some neutral salts, composed of the tartaric acid, as the tartrite of potass and borate of soda, are by some enumerated among antacid medicines, though apparently not well adapted for remedies. The acid in the stomach may indeed combine with their alkaline part, and be corrected by it, but at the same time the stomach will receive a new acidity from them, though somewhat milder and less noxious, attended with little or no advantage.

1308. But soap, which has been frequently given, and highly commended as an antacid medicine, has a worse inconvenience, for while it corrects the acidity of the stomach, it leaves in it a great quantity of thick oil, perhaps rancid. On this account it will be more eligible to abstain from the use of it as an antacid.

1309. Next to these we ought to mention certain gummy or mucilaginous medicines, which are often recommended as antacids, such as gum arabic, liquorice, and the like, and which, though they do not thoroughly correct the acidity, blunt it a little, and, at any rate, in some measure defend the stomach, the inferior part of the gullet and intestines from it. But the qualities and use of these will be easily understood from the observations already made (1301.)

1310. But beside these things, which may with more propriety be called antacids, because they immediately correct the acidity already existing, there are also many other medicines which may in some degree be called antacids, because they check the production of acidity in the stomach: of this kind are many astringent, corroborant, and stimulant medicines. Some think that those astringents which are derived from vegetables have a specific virtue against acidity, by which they attract and detain the acid matter, and correct it in a similar manner as the alkaline salts do: this, however, is not ascertained; and, whereas it is quite certain, that so many other matters which strengthen the stomach, or the whole system, prevent acidity by promoting digestion, it is more probable that those astringent medicines produce their effect in the same manner. Thus, frequent exercise, the cold bath, &c. have completely relieved many from a diseased and most troublesome acidity of the stomach; many, by means of a glass of wine or brandy, a little common salt or pepper, &c. taken with their food, after or before dinner, feel quite well, digest well, and are completely freed from acidity, which otherwise would prove exceedingly distressing. Nay, it is certain that sulphuric acid, prudently administered, is often of great use against acidity in the stomach: some even allege that they have sometimes felt a similar benefit from the use of lemon juice; and many allege the same of a variety of bitter medicines.

1311. Hence some practitioners have been inclined to think that such medicines (1310.), in correcting acidity, have not operated so much by their astringent, corroborant, or stimulant powers, as by checking or moderating that fermentation, to which our aliments have such a tendency (628, 9.), and which would soon terminate in acidity. It must not indeed be denied, that those medicines may have this effect when mixed in great quantity with our aliments,—and that, in this way, the bile is of the greatest advantage to the system, by correcting acidity and checking fermentation; but it is scarcely credible that so small a quantity of them as patients usually take, could have any effect in such a mass of food,—although it may greatly strengthen and excite the stomach, and promote the free secretion of it's juices.

1312. It is however a matter of considerable importance that food be taken the most averse from acidity or fermentation, flesh meat for instance, and aliments prepared from it, in preference to vegetables; and whether animal or vegetable food be used, those aliments that are most easily digested, are to be preferred. For the harder and slower of digestion it is, the longer is the aliment detained in the stomach, and the more it impedes the action of that organ; and thus, though possibly not at all acescent in its nature, it causes the aliments taken along with it to be too much fermented (630.), till they become at length completely acescent.

1313. It is also of great advantage, and ought never to be neglected, in curing acidity in the stomach, to have all the corrupted and acid matter present in it evacuated, either upward or downward, by proper medicines. For such matter being left in the stomach, acts as a ferment, and renders acid all the aliments which otherwise would have been duly digested; besides, it greatly weakens the stomach, and in this way also promotes acidity.

1314. Although the primary use of antacid remedies be to correct acidity wherever it exists, they may nevertheless, on some occasions, serve other purposes also. For it is evident, both from reason and experience, that they may be of advantage in various diseases, which either proceed from acidity, or are joined with it; a circumstance to be accounted for from the nature of those diseases. Thus they are often found very beneficial in several diseases of infancy, in dyspepsia, hysteria, the gout, and calculus in the bladder, or at least in the kidneys. Moreover, some of them, while they correct acidity, relax the bowels, some excite urine, others perspiration, or even sweat in some degree: but this is not the place for enlarging on their qualities of that description.

1315. In fine, some of them, particularly alkaline salts and absorbent earths, when taken for a long time, and in large doses, are not free from inconvenience, or perhaps, in some cases, danger; that is, when they not only correct the morbid acidity, but absorb all acidity whatever. For thus they may induce some degree of putrescence, not only in the stomach and intestines, but in all the fluids, and over the whole body. For within certain limits the acid nature of the aliments has it's advantages, particularly in preserving the body from putrescency.

1316. Since an alkaline acrimony of the fluids was long admitted as a fact by medical men, we need not be surprised that they sought out and frequently employed such remedies as seemed to oppose that disorder. Such they termed Antalkaline remedies: and it is certain, that many of those which are referred to this class, and which are so named, are daily administered with the happiest effects; though, as was already explained in it's own place (542.), an alkaline acrimony is scarcely ever seen in a living person. The fact is, that the same remedies which would have operated against alkaline acrimony, had any such existed in the body, are no less effectual in opposing putrescence, or at least that very morbid state of the system, commonly denominated putrescent; which is an evident, frequent, and very serious disorder, having some affinity to alkaline corruption. Remedies administered to obviate putrescency, are called Antiseptics.

1317. Of these there is great plenty and variety, but not equally suited to all cases of morbid putrescence; which needs not occasion any surprise, seeing there are various kinds of putrescence, proceeding from different causes (537, 40.).

1318. It is necessary also to guard against a very natural mistake concerning antiseptic medicines, and not to trust implicitly that all things, which being externally applied in great quantity, prevent or correct putrescence, will produce the same or similar effects within the body, when administered in small quantity. For though the greatest and best part of the medicines which we use as antiseptics, have similar effects, whether applied externally or internally, in any quantity, and in every kind of putrescence; yet experience sufficiently proves that this does not hold equally of them all.

1319. But as to particular antiseptic medicines, they are of kinds so widely different, and seem to operate in such various ways, that they hardly admit of being classed.

1320. It deserves therefore to be observed, in the first place, that the greatest relief against morbid putrescence often lies in a proper diet; and it requires no dissertation to prove, that matters such as food and drink, which are daily taken in great quantity, and without inconvenience, will be of much greater advantage in correcting the disorder of such a mass of fluids, than even medicines of the greatest power, which, on that very account, cannot be taken but in very small quantity, perhaps only in a few grains. And indeed all good and nourishing food, both animal and vegetable, is of no small use in correcting putrescence, as is evidently observed in the case of persons who have suffered want, of those affected with scurvy, or of such as have long used too sparing and slender a diet. For the most healthy body seems to have a native tendency to putrescence, at any rate to some degree of corruption; and there is commonly no other or better remedy for that corruption, than good meat and drink, such as provident nature every where supplies. But vegetables have much more efficacy in correcting that tendency than flesh meat; partly it would seem from the carbonic acid which it imparts very copiously to our fluids, partly also from their acescent nature, so very much opposed to putrescency.

1321. For the same reason, fresh, tender, and succulent vegetables, as fruits, roots, pot-herbs, &c. are much to be preferred to the dry and hard grains, though even these are more effectual against putrescence than is commonly believed. That distinction formerly adopted by medical men between acescent and alkalescent vegetables, has appeared to more modern practitioners neither well ascertained, nor of great utility; and is now almost neglected. For experience has sufficiently proved, that those vegetables which were formerly esteemed most alkalescent, as cabbage, onion, leek, &c. during fermentation become acescent before they acquire a putrid or alkalescent quality ; so that it cannot be doubted that they counteract putrescence in the same way as other vegetables. Nor indeed do they seem to have any right to appropriate the name of antiscorbutics to themselves, because many other vegetables, especially those most acescent, are equally, or still more effectual against scurvy.

1322. Next to fresh and succulent vegetables, may be noticed new bread well fermented ; and as drink, wort, or ale already boiled and fermented, and all wines, which in nature, principles, or chemical elements, and powers by which they operate on the human body, greatly resemble fresh vegetables.

1323. Here also may be the proper place for adverting to carbonic acid, such as is expelled in great quantity from liquors during fermentation, or from chalk and similar substances, when some strong acid is poured on them. Though this gas is attended with certain destruction when copiously taken into the lungs, yet being absorbed by water, it may be taken into the stomach, or injected into the intestines by the anus, not only without danger or inconvenience, but often with great advantage. Externally used, it possesses such eminent antiseptic powers, as not only to preserve flesh from putrefaction, but to correct putrescence when begun, and even considerably advanced, and to restore matters, already putrescent, to firmness and soundness. We have it from credible authority, that it has been of great advantage externally, in putrid diseases, and in cases almost desperate. It must also be observed, that carbonic acid mixed with water, not only has a chemical antiseptic property, but cools and strengthens the system, as is sufficiently manifest from the effects of certain medicinal waters ; and it is probable enough that these qualities are also not without benefit in various diseases, which are commonly accounted putrid.

1324. After these ought to be mentioned various acids, either vegetable,—and that both native—as the juice of lemons or of other fruits, and factitious—as acetous acid; or fossile,—especially the sulphuric, which perhaps is the best of all. It must also be remarked, that all acids not only counteract putrescence by chemical mixture, but may also prove beneficial in many putrid diseases, by their astringent (1049.) and refrigerant (1230.) qualities; perhaps vegetable acids may also bring relief by another way of operating, when, like fresh vegetables, they are fermented within the body.

1325. As for the alkaline salts, and indeed all other salts, neutral, earthy, and metallic, though the greater part of them, or perhaps all, may be so applied externally, and so mixed with various putrescent matters, as to prove a powerful obstruction to putrefaction,—they seem but ill adapted for remedies, or for being administered internally with this intention in the living subject. Particularly because they could not be taken in such quantity as to produce the desired effect by chemical mixture with such a mass as the human body; also because some of the most powerful of them, when sparingly mixed, seem rather to promote putrescence, because they stimulate the body too much, heat it, and and produce intense thirst; and perhaps all of them attenuate the blood and other fluids too much, and render them acrid. It is very well ascertained, that not only the alkaline salts, but muriate of soda also, which is so effectual in curing meat, by no means defends the living body from putrescence, but rather aggravates the disorder, and renders it inveterate; so that some medical men are convinced that scurvy seldom or never takes place but in those who have used this salt.

1326. There are also some other medicines which have little effect in the living body as antiseptics, and are rarely eligible, though they are enumerated among them by some, and, in fact, most completely preserve from putrefaction putrescent substances out of the body. Of this kind are many stimulants, especially spices (1191.) and distilled spirits, which, indeed, by their excessive excitement and heating effects on the system, often increase putrescence: but in some cases where such morbid tendency proceeds from debility, or is attended with a great degree of it, as in some putrid fevers, it is not improbable that they may be of some use by means of their stimulating property: wine too, and similar liquors, appear to be of some advantage, nearly in the same manner.

1327. Astringent and corroborant remedies are on many occasions of great benefit as antiseptics: of this the Peruvian bark is a very decisive instance. And there is no doubt, that it is by it's astringent, or rather it's corroborant property, that it counteracts the putrescence of the fluids, and not by chemical mixture. For though, when mixed in large quantity with any putrescent substance, it might, in some measure, season and preserve it, it is by no means credible, that so small a quantity as patients are accustomed, or indeed able to take, could be attended with similar effects over the whole of the living body. Besides, it is found exceedingly useful, generally in those kinds of putridity which are greatly dependent on the state of the solid parts, as putrid fevers or gangrenes, and is of far less efficacy in scurvy, which depends more on the state of the fluids. It is probable, that many other medicines of the same kind, and particularly some of the bitters, which by some are usually classed among antiseptics, possess similar qualities; but these have not yet been sufficiently subjected to the test of experience.

1328. Sedative remedies too are sometimes enumerated among antiseptics, and not without cause, seeing not only some of the refrigerants, as was already explained (1324.), counteract putrescence; but opium also, which belongs to narcotics, the other class of sedatives, seems to have had astonishing and very salutary effects in that peculiar gangrene of the feet, in which all other antiseptic remedies have usually little effect. It is not clear by what means it is so beneficial in that species of gangrene, but it must be observed, that the disease is very painful, and opium, administered to allay the pain, produced at the same time a greater and unexpected benefit; it is therefore probable enough, that the use of it in that disease, consists chiefly in removing or abating the morbid irritation with which it is accompanied.

1329. Hitherto we have treated of the general and internal use of antiseptic medicines; it ought, however, to be known, that it is often advantageous to apply some of them externally to particular parts of the body, which may be threatened with putrescence from various causes. Thus it is often of no small advantage to apply to scorbutic ulcers, and indeed to other very putrid and foetid ulcers, fomentations of fresh and succulent herbs, and other acescent matters containing much carbonic acid; which in a short time correct the fetor of the ulcers, and greatly promote their cure, in a way similar to that in which they counteract the general putrescence of the system. And generally in every kind of gangrene, practitioners usually apply to the parts affected certain antiseptics, especially various stimulants, as distilled spirits, which seem in many cases to prove beneficial. But it is not yet agreed, whether in such a state they produce their effect solely by their antiseptic, or rather, which seems much more probable, by their stimulant quality; which either renews and gives intensity to the impaired action of the blood-vessels, or produces inflammation and a healthy suppuration at the margin of the sound flesh, which separates from the sound the parts already putrid and corrupted, and prevents the disease from spreading farther.

1330. But, besides all the medicines already enumerated, there are certain other remedies which have the best right to be classed among antiseptics; such as resist putrescency so powerfully, that they are often sufficient to prevent it, though no medicines be administered, greatly assist and promote the effects and action of any medicines, and ought never to be neglected in preventing or correcting putrescency.

1331. Cold especially is of the greatest use in opposing putrescence, especially in putrid fevers, and other similar diseases, in which it is a safe, very salutary, and in general, a necessary remedy. For it is sufficiently evident that such diseases, in their nature and origin slight, mild, and not at all putrid, are often aggravated to a surprising degree by heat, and become quite malignant and putrid; and others, on the contrary, already severe, malignant, and putrid, by a proper application of cold, become in a short time mild, and change their general character. But as we have so often adverted in various places to the powers of cold, it will be sufficient to notice just now, that it is not by it's chemical properties alone that it prevents putrescence, or checks it when commenced; but it is of the greatest advantage by it's sedative and corroborant powers, correcting in the best manner various disorders of the system, as debility, or too impetuous a circulation, which otherwise would quickly terminate in putrescence. Wherefore, in such diseases, it is necessary not only to avoid all unusual heat, but to administer cold as far as the patients can endure it by air, in drink, and in every other way.

1332. Cleanliness also, is generally of incredible advantage in preventing or correcting putridity; so much so, that by due attention to it, many persons have lived long safe and sound, who otherwise would have sunk under the worst putrid diseases. Nor is it less certain, that a want of cleanliness is extremely noxious, and quickly produces even among those in the best health, the severest putrid diseases, especially fevers. This, in fact, ought not to excite the least surprise, seeing, as was already explained in it's proper place, the body, even in the best state of health, can in no other way preserve it's soundness and purity, than by expelling it's particles which are become corrupted and noxious; and these, if not duly expelled, or when anew applied to the body or received into it, cannot fail to have noxious effects. Experience likewise attests, that want of cleanliness greatly impedes the perspiration. But if such be the state of things in health, it will readily be admitted, that such a habit must be much more pernicious to the sick, whose bodies are already in some measure putrescent and corrupted, a matter of which experience has already furnished more than sufficient evidence. Wherefore in all putrid diseases, especially in those attended with fever, the utmost attention must be paid to cleanliness; and not only in regard to the bodies and body clothes of the patients, but to their beds and bed-rooms; and above all things to the air which they breathe, which, when pure, is found the best of remedies,—when impure, the worst of poisons. Care must also be taken, that nothing putrescent be left in the bed-room that might corrupt the air. It is also to be observed, that not only the patients, but the medical and other attendants, are very deeply concerned in practising the utmost cleanliness; for this is most calculated both for counteracting the disease, and guarding against it's contagious effects.

1333. It is also beneficial in no small degree, both in preventing and correcting putrescency, to promote by other means those natural functions by which putrescent matters should be eliminated. For, when these become languid or obstructed, the body becomes more quickly putrescent, and to a greater degree; but when they go on properly, the putrefaction which otherwise would quickly come on, may be long resisted. Thus, for instance, frequent exercise, by promoting perspiration, defends for some time from the scurvy, which bad provisions and other causes would have quickly produced, while the same disease has seized the indolent in a short time. In scurvy too, and still more in putrid fevers, it is of great advantage so to promote the alvine discharge, that no corrupt and putrid matter may accumulate in the intestines, which might not only produce the severest inconveniences in the bowels, but give a great impulse to the general putrescency of the system.

1334. Lastly, in either preventing or curing putrescence, it is necessary to pay a sedulous attention to the causes of it, which are various, and to counteract them severally as there is opportunity. Thus, while it frequently proceeds from debility, or, at least, is greatly aggravated by it, in general all corroborant and stimulant remedies, even those which affect the mind itself (1131, 5.), are found to counteract the disease. But as in not a few cases, either the whole system or some particular portions of it, acquire a putrid tendency, either from too great impetus of the blood, from excessive heat, as in fevers, or from excessive action of the blood-vessels, as in inflammation followed by gangrene; in such a state stimulants and corroborants will prove hurtful, while remedies entirely opposite, as debilitating or sedative, particularly refrigerant remedies, will prevent or abate the putrescency.

CHAP. XXXIII.

Of evacuant remedies in general.

1335. NEXT to those classes of remedies which correct the various disorders of the solids or fluids, come to be considered those called Evacuants, which effect some evacuations beyond the usual quantity, either by the natural channels, or by others new and artificial.

1336. There is no little variety in the remedies of this description, and since in the treatment of diseases they answer so many and so important purposes, and affect the body so powerfully, and in so many different ways, it will be necessary to treat of each of them separately. But, because most of them, or possibly all, have many things in common, it seems not unseasonable to premise some general remarks and directions concerning their nature, action, and uses, before treating of them separately.

1337. Here it must first of all be observed, that the use of evacuant remedies rests on the firmest foundation; for various remarkable and unusual evacuations, as vomiting or purging, profuse sweat or flow of urine, or of blood, often come on spontaneously, and in many cases with the happiest consequences; so that no doubt can remain, that by such evacuations, nature relieves itself of various diseases with which it formerly contended. Sometimes also, whether by nature or by accident, as by wounds or burnings, ulcers take place in different parts of the body, which prevent, alleviate, or cure various diseases which had formerly been familiar.

1338. It is not surprising then, that physicians, and even the rudest of men, instructed by such cases as by nature herself, should have attempted by art similar evacuations in similar diseases, seeing a vast number of suitable medicines are every where furnished, the powers and properties of which, almost daily incidents, and sometimes very happy ones, had pointed out.

1339. In many diseases too, experience has often sanctioned that artificial method of cure, and reason still farther confirms it as soon as their nature and causes are in any measure examined and ascertained. But practitioners have often reasoned very absurdly concerning the use and effects of the various evacuations in the cure of diseases; supposing, for instance, according to the opinion formerly almost universal among medical men, and still admitted by many of them, and by the mass of the people, that they had no other beneficial effect than by obstructing or expelling from the system some morbid and noxious matter, such as they supposed present in most part of diseases, and the cause producing them.

1340. It is decidedly evident that certain evacuations, particularly vomiting and purging, instantly expel morbid and noxious matter, if any be in the stomach and intestines, and thus are of signal advantage in many diseases, though in various cases they likewise serve other purposes of perhaps no less moment. It were easy to account for these; but in the case of other evacuations, as that by urine and sweat, or by blood-letting, &c. it is very difficult to understand, and indeed quite incredible, that they should leave the sound, and evacuate only the morbid part of the fluids. Nor would it be reasonable to expect from the use of these any other effect on the fluids than a diminution of their quantity, an effect sometimes beneficial, sometimes the contrary. It must not, however, be inferred from this, that the different evacuations operate solely in this way; for both reason and experience shew that in many diseases they produce beneficial effects in other widely different modes of operation. It is therefore necessary to attend to the various effects which they in reality produce in the human body, that the use and administration of them may be the better understood.

1341. In the first place, then, the various evacuations in the greater number of diseases prove beneficial, by diminishing the quantity of the circulating fluids. For many diseases entirely depend on the superabundance of these (513, 15.); and such plethora is a part of many severe diseases, and partially at least their cause. On many occasions also when that disorder is present, though it be not at all the cause of the urgent disease, yet it so impedes and oppresses the conservative and salutary powers of nature, that they prove unequal to the restoration of health; and in this state it is evident that, by means of proper evacuations, the disease will either be entirely cured, or at any rate, by relieving and assisting the salutary powers of nature, will be rendered milder and more easy of cure.

1342. Also, in many diseases, various evacuations are of advantage, by producing a greater determination of the blood, perhaps also of the nervous energy, towards those parts whence the fluids have been abstracted, or where the excretions have taken place; not only by relaxing and opening the channels of the fluids in those parts, but by imparting to them at the same time a vigorous stimulus, and exciting them to more powerful action, which occasions a greater quantity of blood to be conveyed to them (475, 78.) and less to others: for the greatest number of evacuations are accomplished by means of stimulants (1176, 77.), some indeed by emollients and laxatives (1088.), and all, by whatever means they are begun, cannot but relax and open the vessels by which the fluids are effused. In this way they frequently operate in removing or alleviating many diseases of other parts contiguous to or remote from those whence the evacuation is made. Thus, morbid determinations of the blood to certain parts, congestions in them, spasms, perhaps also sometimes obstructions, are obviated by proper evacuations from remote parts.—On this foundation rests the doctrine of revulsion, which was long fashionable with medical men, and indeed is not even now quite obsolete: also the antispasmodic power of evacuants is, in a great measure at least, to be referred to the same circumstance.

1343. Farther, many evacuations are found very beneficial for removing various morbid affections of the parts whence they take place; which is particularly observable when blood is drawn from the inflamed parts by the lancet, scarification or cupping, or when a blister has been applied.

1344. Various evacuants are also beneficial in removing such impediments, whether proceeding from obstructions or torpor, as by resisting the action of any secreting organ, render it's secretion too sparing. This benefit is almost wholly attributable to the stimulus of the remedy applied, which increases the determination of the blood and nervous energy to that part (475.): and the impediment, of whatever kind, being thus once removed, the secretion will thenceforward go on in due and natural quantity. A striking instance of this may often be seen in dropsical patients, whose urine is generally in small quantity; but when, by proper medicines, it is once caused to flow more copiously, it not unfrequently continues to flow freely long after the medicines are discontinued.

1345. Also several evacuations induced by art, are in many cases beneficial, by suppressing or at least abating other evacuations of a morbid nature, which were either previously very troublesome, or could not otherwise be stopped. In this way a copious sweat is often useful, sometimes absolutely necessary, for restoring the tone of the bowels in a long continued and obstinate diarrhoea: and purging sometimes proves a good remedy for repressing excessive sweats or great flow of saliva.

1346. Many evacuations also become beneficial when at any time the system has been suffering injury by the suppression of any other usual discharge, whether such discharge had been natural, or effected by accident or long continued habit. In many instances too, evacuations, either originally morbid or at least preternatural in their commencement, as the haemorrhoidal discharge, inveterate ulcers, diarrhoeas, copious sweat, or frequent blood-letting, become salutary rather than otherwise, and at length so necessary to health that they cannot be suppressed but with the greatest risk. Nor is the mode of operation obscure by which new and artificial evacuations bring the most effectual relief to the body when suffering under the suppression of former ones,—by resisting the superabundance of fluids which would otherwise take place, or removing it if already present, but farther by guarding against, what are always to be dreaded in such a state, those irregular and pernicious distributions of the fluids, perhaps toward parts which could ill sustain them. Nay, some think that the body, being long accustomed to such discharges (1339.), purges itself by that means from many noxious humours by some power not easy to be explained; and of course, when these discharges are suppressed, new ones are requisite, that such noxious humours may as formerly be expelled.

1347. Many evacuations, particularly a great flow of urine, copious sweat, smart purging, or full vomiting, are often of admirable use, by increasing the action of the absorbent vessels (438, 9.), which take up the fluids exhaled or effused all over the body, and convey them again into the blood. They sometimes produce this effect, in part at least, by their stimulus, which excites those vessels, as well as every other part of the body (1166.), to new and more vigorous action; but more frequently, and to a greater degree, by withdrawing or dissipating the greatest part of the thin fluid which had been in the vessels: whence there arises quickly a necessity for a new supply of such humour, a necessity which nature supplies in the best possible manner, by taking up the requisite quantity from that store which is most in readiness. For it is well known that in other instances also, where there is no disease, the greater the necessity of a supply of thin fluid to dilute the blood, the more of such fluid is imbibed from the stomach by the lacteal absorbents, and taken into the blood; as in those who, from heat or violent exercise, have been long in a profuse sweat. In this state, persons yielding to the incessant cravings of thirst, will sometimes swallow in a very short time an incredible quantity of water or other weak drink, and neither feel it weighty nor their stomach distended, because it is so suddenly absorbed from it that it is scarcely perceptible. How different the circumstances are in the case of those who sweat not or thirst not, every one who ever happened to drink plentifully will have more than sufficient evidence in his own person. From this will be readily understood the administration and use of many evacuant remedies in curing various dropsical diseases, in which, it is well known, they are generally of signal advantage.

1348. In fine, some evacuations become serviceable in certain diseases, in a manner very obscure or entirely unknown. This is the less surprising, because the nature and proximate causes of many diseases are not yet ascertained. Thus, for instance, many fevers, both intermittent and continued, are removed in the best possible manner by various evacuations, natural or artificial, and sometimes so suddenly as would be incredible, were it not frequent and manifest. This circumstance has been variously and industriously tortured by different authors, that it might quadrate with the opinions which they severally patronised. But it is better to leave undecided a subject so obscure and uncertain, than to embrace any opinion not yet fully investigated and confirmed. It is probable indeed that the body under fever may by such evacuations be relieved in various ways, and it's conservative and salutary powers much assisted, by withdrawing a superabundance of humours, perhaps expelling what was very noxious, by accellerating many functions previously languid, or nearly obstructed, and causing them to proceed steadily afterwards. But it is a gross mistake to ascribe the signal benefit usually derived from those evacuations to the expulsion of any such morbid matter, as by so many physicians has been in every age supposed the cause of fevers; because the excreted matter for the most part neither appears morbid, nor to contain any thing diseased, when, by it's removal, it proves of the greatest advantage; and often, on the contrary, when it is very morbid, the evacuation seems not to be of the smallest advantage, and rather hurtful. But whatever decision may be given on that question, it is the business of a wise and skilful practitioner, relying on experience, to make use of such aids, though little understood, in those diseases in which they have so often and so manifestly proved beneficial.

1349. It is to be observed, that many evacuants greatly affect the system, and are consequently of use in various diseases, not only by the depletion which they produce, but also by other properties which they possess. Thus many of them are stimulants, and indeed very powerful remedies of that kind; others again are emollients, sedatives, refrigerants, or demulcents. Hence, it will readily be admitted that all medicines which are referred to the same class of evacuants, as to emetics, cathartics, diuretics, or sudorifics, are not equally suited to every disease in which there is occasion for such evacuations; and, of course, that a proper selection of them is always useful, sometimes absolutely necessary: for it often happens, that in the same patient, of two purgative medicines, the one might bring great relief, the other prove nearly destructive.

1350. As to the discharges which are the effects of the various evacuant medicines, it is most certain that all of them, especially the great and lasting, diminish the vital powers, and weaken the body very much, with the greater certainty and effect the more abundant they are. But if on any occasion they seem to have a contrary effect, it is without doubt to be attributed to their other qualities, by which they counteract various diseases, and other causes of debility. For generally all diseases, however differing in other respects, have this in common (380.), that they produce some degree of debility, of which a superabundance of blood is a striking instance (514.). It is therefore no surprise though remedies, which so effectually diminish that, and relieve or remove other diseases, should decidedly counteract a debility which had no other source; though the remedies would, in other circumstances, have greatly weakened the system.

1351. Hence it is farther evident, that in consideration of their debilitating effects, and perhaps others of not less importance which depend on these, evacuations if not necessary will generally be pernicious; so that the excellent remark anciently made by Celsus concerning one kind of them, may, with the greatest justice, be affirmed of them all, *Non semper aegris prodesse, semper sanis nocere.* "To the sick they are not "always beneficial, but to the sound always hurtful." We must, therefore, always recollect, that we ought not to trifle with remedies so powerful. It is a bad, and generally a pernicious custom to administer remedies of any kind where they are not required: many, however, of the medicines already enumerated, are so mild and almost inactive, that in many cases, even without necessity, they may be long given to the sick, or used by those in health with little inconvenience or danger. But evacuations are accompanied with a present and more serious danger, and require greater prudence in directing them: to the sick they must be prescribed with caution, to the healthy always prohibited; because, when brought on unseasonably, in various diseases they are capable of doing more injury to many patients in a moment, than medical skill or the powers of medicines can afterwards compensate: employed in health, they always somewhat impair the salutary powers inherent in the body; they augment, impede, or derange it's functions; and by wasting it's conservative powers, render it more liable to innumerable diseases. Nor is it the least of their inconveniences, that by frequent use or long habit, they not unfrequently induce or increase the very disorders for the prevention of which they had been prescribed,—and that, in many cases, though really injurious, they become in some degree necessary, either to prevent worse consequences (1346.), or to promote functions, which being long accustomed to such assistance, cannot be performed without it.

1352. Whoever duly attends to these considerations, will readily discern how serious and dangerous was the mistake of those who supposed that the most effectual mode of preserving health, or preventing disease, was by proper evacuations at definite periods. But such was the common and universally received opinion among the ancients, that they made more use of some evacuations, those to wit, by vomiting and by stool, as preservatives of health, than as remedies for disease. But above all others the doctrine of Stahl, which imputed the greater part of diseases to plethora, favoured that opinion. It is not surprising then, that an error consecrated by it's antiquity, commended and confirmed by the authority of great names, should still prevail among the people in many countries, and not yet be quite obsolete among some professional men. Neither indeed must it be denied, that though such a use of certain evacuations be generally pernicious, it is sometimes not unprofitable; namely, in the case of those whose life is an incessant course of luxury and indolence, whose bodies are stuffed to excess with rich food, and never duly disburdened by proper exercise; while certain parts, particularly the stomach and intestines, loaded and oppressed to a noxious excess, and farther debilitated by an improper manner of life, can neither digest the load they have received, nor perform the due excretions. In these circumstances, therefore, the various evacuations, unprofitable or injurious to persons in health, may, for a reason no way obscure, become very useful, or absolutely necessary to persons who can hardly be accounted healthy; since if they are not actually sick, they are on the way to be so. And, indeed, it is quite reasonable, and not at all surprising, that they, whose life is against nature, should frequently stand in need of assistance not less preternatural. But they who live agreeably to nature, unless there be some more serious cause of disease, will preserve health quite well by it's conservative powers: for nature can require no remedies; *Cujus quidem administratio* (to use the words of Cicero,) *nihil habet in se quod reprehendi potest; ex iis enim naturis quae erant, quod effici potuit optimum, effectum est: doceat ergo aliquis potuisse melius; sed nemo unquam docebit: et si quis corrigere aliquid volet, aut deterius faciet, aut id, quod fieri non potest, desiderabit.*

1353. In short, though evacuations produce so many salutary effects on the body (1340, 52.), and in many diseases are not only useful, but altogether necessary; yet they are not always suitable, nor free from danger, even when on various grounds they seem to be most required: as the body may be affected with various circumstances which, during their continuance, render it incapable of bearing almost any kind of evacuants. Hence there is often a great difficulty when some serious disorder evidently and urgently requires a remedy of this description, and, at the same time, the body cannot bear it. But of this sort of difficulties, and the means of removing them, enough has been said elsewhere (967.). It will therefore be sufficient to mention here what circumstances of the body render it most unfit for the use of evacuations: not indeed all the conditions which have such a bearing on each evacuation, which will be attended to at more length when we come to discuss the several classes by themselves; but those only which render the body unfit to bear all the evacuations in general.

1354. Among the first of these we must notice debility, the reason of which is evident; for it can be no surprise, that remedies which so debilitate the body, should prove hurtful to it when it has been previously much debilitated. It is also to be remarked, that debility is a disorder so complex, arising from so many causes, and in so many diseases, that we must very often abstain from evacuations on account of that alone.

1355. Likewise putrescency, already existing in the body, or a morbid tendency to it, render evacuant remedies improper. The reason of this is somewhat more obscure, but it is certain; and it is plain enough, that debility and putrescency are disorders very closely connected, so that the one always favours the other, and prepares the way for it.

1356. Again, great mobility of the system is, in almost all cases, ill suited to evacuations: not only on account of that connexion and almost uniform affinity between mobility and debility, but because bodies very delicate and irritable are, by so powerful remedies, often wonderfully deranged and convulsed.

1357. In a word, a scrophulous constitution, whether that complaint has shewn itself openly or not, deserves a place among those circumstances which render the body impatient of almost all evacuations. Perhaps there is no other reason for this than that scrophulous persons are of a lax, flaccid, and feeble structure, and therefore ill calculated for bearing very relaxing and debilitating remedies.

1358. In fine, beside the present symptoms of disease, a great number of circumstances observable in different patients, often show that some evacuations are improper, that others are more suitable, and to be preferred to all the rest. To this head belong the age, still more the idiosyncrasy, sometimes also the shape of the patient, the climate he enjoys, the mode of life in which he is engaged, and, in a word, the general character of the disease which is present.

1359. Thus children surprisingly bear evacuation by purging or blistering, but with more difficulty the loss of blood; adult persons sustain the latter with greater ease, the former with less.

1360. Some have their body of such a constitution, that it can scarcely be brought to sweat by any remedies; on the contrary, some sweat very easily, and by that means recover from many slighter diseases, as colds, slight fevers, &c. Some, it is said, cannot vomit, and certainly many cannot vomit without great pain, violent straining, and an almost general convulsion; while many others vomit with the greatest ease almost at pleasure, and without medicine. Some, otherwise in sufficient health and vigour, faint at a very small loss of blood; while others lose an incredible quantity easily, and without inconvenience.

1361. Those who live in a sultry climate bear ill the loss of blood, they indure purgatives better: those in cold regions generally sustain that evacuation to a very great extent.

1362. Those whose life is laborious and hard, bear very well the loss of blood; the indolent, sedentary, and effeminate, neither bear that, nor indeed any powerful evacuation well; and often during sickness require the milder purgatives.

1363. Different diseases have such a different appearance and nature, that immediately on the first view, some of them seem to require appropriate evacuations. Thus, in ardent fever, or violent inflammation, when the whole blood, and, indeed, the whole body being in a boiling state, the very appearance and character of the disease shews that blood must be copiously abstracted; while in dropsy, the pallid countenance and bloodless body, overwhelmed with watery fluid, give more than sufficient warning that no such operation is requisite, but other means very different indeed, which may abstract the watery fluids.

1364. Writers wish to distinguish and class the various evacuations in use in medical practice, either according to the nature of the fluid which is effused, namely, whether dense or thin, and thus distinguish them into sanguine and serous; or, according to the channels by which they are effused, as natural or artificial; and, accordingly, refer to one class emetics, cathartics, diuretics, sudorifics; sialagogues, the emmenagogues, &c.; and to another class, all abstraction of blood, and the evacuation of thin fluid, or of pus, by epispastics, issues, or cauteries, &c.

1365. To know these things is proper, and certainly not at all difficult; but in treating of the evacuations severally, there seems no farther occasion for order, than that those things which seem to have the greatest resemblance or agreement between themselves should be placed next to each other in the consideration of them ; as vomiting and purging, a copious excretion of sweat, and great flow of urine, &c. that it may be the better understood what is peculiar to each, and what is common to several.

CHAP. XXXIV.

Of emetics.

1366. Those remedies which excite vomiting are called Vomitoria or Emetics. What sort of action vomiting is, the mechanism of the parts by which it is performed, the causes which most frequently excite it, and the mode of operation by which it produces the greatest portion of good or bad effects, has been already explained in it's own place (673, 78.). It only remains now to take a view of the principal classes of medicines which are usually employed for producing vomiting, and to explain the qualities and uses of each; and, for the sake of order, it may not be improper to begin with the mildest, afterwards advance to the more powerful, then to the most violent. For it must be remarked, that the stomach is so delicate and irritable, and has such sympathy with other parts, that it is excited to vomiting, not only by the greater number of the more powerful stimulants, if they are taken into it, but frequently by substances very mild and destitute of almost every stimulus; sometimes by matters really sedative, or even narcotic. It must also be recollected, that in this particular there is a great difference between different persons, so that some are very easily caused to vomit, and others only with the greatest difficulty; and what is more surprising, milder medicines will sometimes accomplish what has been attempted in vain by the most powerful.

1367. It is therefore to be observed, in the first place, that all drink, however bland, mild and grateful, has some tendency to excite vomiting; so far at least, as to render it more prompt, easy, and copious, in cases in which it would otherwise have been very difficult, laborious, painful, and producing little or nothing but ineffectual retchings. The greater the quantity drunk, within certain bounds which will be discussed afterwards (1402.), the vomiting will be so much the more expeditious and easy; so that it can scarcely admit of a doubt, that the distention of the stomach gives a considerable and effectual stimulus to it's muscular fibres. For it has already been demonstrated elsewhere (305, &c.), that this is a very powerful stimulus to all the muscular parts.

1368. But drink will yet more promptly promote vomiting, if, though still very mild, it be also rendered nauseous. Many things, otherwise void of stimulus, are very ungrateful to the taste, and apparently, by the unpleasantness of their flavour, violently affect the stomach often to nausea and vomiting, whence they have their name, though there has not been a mouthful of them swallowed; and with still greater certainty and effect, if they have not only been tasted, but received into the stomach. Pure tepid water, than which nothing is more bland, or the same mixed with a great proportion of sugar or honey, or green and mild oil, produce this effect in many, especially such as have not been accustomed to it; food also, and drink corrupted or unpleasant to the taste, and the far greater part of the medicaments found in the shops. Some indeed wish to account in another way for the nauseating effect of tepid water; supposing that by weakening the muscular fibres of the stomach, it renders them more liable to irregular movements, such as vomiting, and perhaps nausea too.

1369. But many substances are at once nauseous, and in some degree stimulating, which are consequently more proper for exciting vomiting, or promoting it when already excited by some other medicine. Of this description are many bitter infusions, as of green tea, camomile flowers, or leaves of centaurea benedictus, &c.

1370. Other stimulant medicines also, and much stronger ones, taken from the vegetable kingdom, are often used as emetics.

1371. The chief of these is certainly the root of ipecacuanha, a very nauseous medicine to be sure, but so mild, and at the same time so efficacious, that it seems very well adapted to common use; since the very weakest, who need an emetic, may safely take a small dose infused in wine or water; while it may be given without danger or inconvenience to four times the quantity, or more, to persons of a more vigorous frame, or who vomit with greater difficulty. And, in fact, all the inconvenience of having taken it in too large a dose, amounts only to this, that it induces the evacuation more quickly, but with no more severity. Such an emetic, at once safe and efficacious, and adapted to almost every patient, was unknown to the ancients: a defect fully discerned and regretted by our countryman Sydenham, than whom a more sound or sagacious practitioner has not appeared among either ancients or moderns.

1372. Also some acrid plants of various kinds already enumerated (1190.), are of use as emetics; as the root of horse-radish, the infusion of which is sometimes given solely with this indication, but more frequently to promote the action of another medicine;—or mustard, the flower of which mixed with water, and received into the stomach, is found an effectual and safe medicine; and believed to be very well adapted, especially to paralytic patients, or to those whose stomach is affected, when owing to any circumstance their case requires an emetic.

1373. Also the root of squill (1190.), being at once very bitter, nauseous, and acrid, has been often given as an emetic, but seems little adapted to common use; for it's effects are so uncertain, that while a very small quantity will in one person produce immense discharges, in another, perhaps ten times the dose will not even produce nausea. By some it is supposed to possess a specific property of promoting expectoration, and therefore to agree exceedingly well with those patients whose lungs are oppressed with much mucus or other matters, which ought to be expectorated.

1374. Likewise a great many other acrid plants have sometimes been given to produce vomiting, and by some persons commended, such as asarum, or groundsel, &c. which yet seem to possess no peculiar advantage, and consequently are now generally neglected by practitioners.

1375. In short, many plants truly narcotic, and their preparations, as tobacco, foxglove, hemlock, and even on some occasions opium (1219.), prove sufficient emetics; but many things preclude their frequent administration with this indication, though some of them, particularly tobacco, are often enumerated among emetics. This last, if any thing, possesses a certain and specific power of affecting the stomach and exciting vomiting; since it produces a horrible nausea, violent vomiting, with severe retchings and pains, and great anxiety; not only when taken into the stomach in substance, but it has the same effect, at least to persons unaccustomed to it, when only chewed, or smoked, when the leaves are applied as a poultice to the region of the stomach, or when the decoction or infusion is administered by way of clyster. It was necessary to make these remarks, not that so horrible a medicine should be prescribed as an emetic, but for the purpose of deterring from the use of it, by the dread of such certain and cruel effects; if at any time it might seem likely to profit in any other way, when such vomiting as the above would be improper.

1376. Many salts taken in large doses, excite nausea and vomiting; but few are usually administered with this intention, or classed among emetics.

1377. The muriate of soda mixed with water, or rather sea water, when it happened to be within reach, was much in use among the ancients as a milder medicine; and seems sufficiently fitted for being administered when the more usual medicines (1369.) are not in readiness.

1378. The solution of the carbonate of ammonia is sometimes administered with this intention, and not improperly, especially if there be no occasion for a stronger medicine; or when a stronger one had been previously given, but from various circumstances had not operated well, the action of which may therefore be assisted and promoted by this salt.

1379. Of metals, some are often prescribed as emetics, and are in reality good medicines; especially when reduced by proper acids into the form of salts, that they may be more readily dissolved in water, and divided into very small quantities, such as are often necessary. For all metals which excite vomiting are not proper for internal use, such as copper which is commonly numbered among emetics; though it seems to possess no peculiar advantages, and on account of it's remarkable acrimony, and almost poisonous quality, ought never to be given, unless in very urgent cases when no other safer medicine is at hand.

1380. Various preparations of mercury also excite vomiting; but of these the yellow sub-sulphate alone is enumerated among emetics, though on account of it's singular acrimony and very violent effects on the system, it is rarely administered, nor is it at all adapted to common use. It is said to have sometimes produced astonishing effects in some diseases, particularly of the venereal kind, and in hydrophobia; and it is probable enough, that besides vomiting, it may produce a great flow of saliva. But all these good effects have no dependence at all on it's emetic powers.

1381. Zinc likewise furnishes a very effectual emetic, in many cases extremely useful, though on account of it's sudden and powerful action, it is less adapted to general use: this is the sulphate of zinc, which is not so acrid or virulent, but that it may be given with abundant safety, and is at the same time so powerful, that it produces the most complete vomiting very speedily; and of course is preferable to almost all other remedies of this class, when any deleterious or poisonous substance has been taken into the stomach; or, when for any reason whatever, we may desire a sudden and complete evacuation of this organ.

1382. But of all the metals, perhaps also of all other substances, antimony possesses the greatest emetic powers, and many preparations of it are in daily use, which, in many diseases at least, are considered as far excelling all other emetics. But it is unnecessary to enlarge on each of the preparations of antimony, as all have similar qualities, only differing in degree of strength.

1383. It has often been debated among medical men, whether the medicines of this class (1359, 1374.), produce vomiting by any specific power operating on the stomach, or by their general stimulus, primarily affecting the stomach, as being the part to which they are directly applied. Almost all of them, as will be evident from the enumeration, are in reality stimulants, and many of them have a considerable effect in stimulating other parts of the body besides the stomach. This is remarked as holding particularly true of the intestines, so that all the more powerful emetics, when given in too small a dose for exciting the stomach to the irregular and inverted motion requisite to their rejection,—when they pass the inferior orifice of the stomach, and are applied to the intestines, greatly stimulate these, and not unfrequently produce violent purging. Thus, for instance, many preparations of antimony, mercury, and ipecacuanha, though duly classed with emetics, may be so administered as to produce no vomiting, and become good cathartics. Some of these, as also others, such as squill, when taken in a dose too small to operate either as an emetic or cathartic, often stimulate other parts, and thus produce other discharges, as urine, sweat, or saliva. Likewise too strong an emetic frequently operates both upward and downward; and for the like reason, too keen a cathartic operates by vomiting as well as by stool. Nay more, almost all cathartics, when given in too large a dose, usually produce vomiting, so that in a certain sense they may be called emetics. Hence it will be quite evident, that the qualities of such medicines are not so specific as some medical men have believed. It is nothing to the purpose to remark, that some emetics injected into the veins, evidently affect the stomach and produce vomiting; for it is clear from experiments, the result of which by no means encourages repetition, that many acrid medicines, equally emetic and cathartic, and indeed many other substances apparently very mild, when thus injected into the blood, often convulse the whole system in an astonishing manner, and particularly produce vomiting and purging. Yet it must not on that account be denied, that any special correspondence subsists between emetics and the stomach : for it is clearly decided, that various substances affect the stomach much more easily, and in a much greater degree than they do the intestines ; and some, as the tartrite of antimony, or ipecacuanha, which, with the greatest violence stimulate both, have little or no effect on other parts, such as the skin, the tongue, or the eye, parts which are certainly neither destitute of feeling, nor of irritability. Nor is it any matter of surprise, that the same remedies should greatly affect both the stomach and intestines, and that at one time emetics should relax the bowels, and at another cathartics produce vomiting ; since these parts have a structure so similar, and are connected by the very straitest bond, not only of vicinity and common function (356.), but of the keenest feeling and peculiar sympathy.

1384. But besides these things already mentioned, and many other similar medicines, there are also certain other remedies which may produce vomiting. Thus certain motions, especially sailing, or gestation in a carriage, or rotation of the head or of the whole body, which induce vertigo in those not accustomed to them, frequently produce nausea (267, 271.) and vomiting; for these affections are very closely connected, so that vertigo very readily produces nausea, and nausea vertigo, and of course either is frequently induced by the same causes. Some believe that sailing produces the best effects in certain diseases, by the repeated vomiting and almost perpetual nausea, which it frequently brings on in persons not accustomed to it, and that for a long time. And indeed, when it is convenient to attempt such a method of cure, a protracted nausea or frequent vomiting can be excited by no other means more safely than by sailing : for there are very few instances of sea-sickness, however unpleasant and violent, doing much injury to the system. But no person would make trial, or, if he would, could support the operation of similar and equally protracted nausea, when excited by medicines.

1385. Likewise, by reason of the sympathy between the fauces and the stomach and large muscles of respiration which are convulsed in vomiting (1173.), the irritation of the fauces, by inserting a finger or feather, produces nausea and retching, and frequently complete vomiting; hence it is often of use for promoting the action of medicine in persons difficult to vomit; even when no medicine has been taken, it is not unfrequently adequate to produce vomiting in those who are easily operated upon, provided the stomach be either too full (1367.), or loaded and inclined to nausea by crude and corrupted food.

1386. Emetics produce numerous salutary effects, not only on the stomach itself, and the parts contiguous, connected, or co-operating, but also in many cases in those very remote, and indeed in the whole system. Of these effects some are manifest, simple, and very easy to be understood; others are obscure enough and difficult to explain; it is, however, necessary to be acquainted with all, though the reason of them be either altogether concealed or inaccurately apprehended; for on this foundation the administration of them in the treatment of diseases entirely rests.

1387. In the first place, then, it is clear that they empty the stomach effectually and suddenly. Hence they may be expected to have the best effects when any poisonous, or, at any rate, unwholesome matter has been taken; or when the stomach is loaded and oppressed with indigested food, a case not uncommon, and readily distinguished either from the preceding causes of the disease; as some surfeit or improper sort of food, or from the numerous and manifest symptoms of a disordered stomach,—such as loss of appetite, great thirst, frequent eructation, acid or putrid, nausea or spontaneous vomiting, inflation and pain in the stomach, anxiety, restlessness, vertigo, sense of weight or pain of the head, a foul tongue or unsavoury breath, especially in the morning, &c.—all which are generally observed both in fever and many other diseases.

1388. They also promote the secretion or flow of the fluids of the stomach and intestines, and of the contiguous or co-operating parts; as of the mouth, in which the saliva flows most copiously during vomiting (673.), or of the liver, whence a very great quantity of bile is frequently discharged during vomiting, especially when it is violent and lasting. Hence they are beneficial when these humours are deficient, a case which seems sometimes to happen, producing dryness of the mouth, slow and depraved digestion, and costiveness: or when there is an obstruction of the bile, which is a very common disorder, and produces jaundice. They seem to operate in disorders of this kind, partly by their stimulus applied to the stomach, thence communicated by sympathy to other parts; partly by the violent agitation and inverted motion of the stomach and superior part of the intestines; and partly by the great pressure during vomiting upon all the contents of the abdomen, owing to the powerful contractions of the diaphragm and abdominal muscles.

1389. For a similar reason emetics are said to be sometimes useful in other obstructions of the abdominal viscera, besides those which produce jaundice, by thoroughly agitating and exciting the affected parts, and giving considerable facility to the circulation, which is ready to become languid in those parts. On this also, at least in part, seems to depend that advantage which many patients have reaped from them when labouring under dyspepsia and hypochondriasis. There is little occasion for enlarging on the use of emetics for bursting abscesses in the throat, the lungs, or the stomach, &c.; not because there is any doubt of their producing such effects, or because it is incredible that this should sometimes be happily accomplished; but because the instances are very rare where such aid is requisite, and rarer still when the experiment of so harsh and dangerous a remedy is either suitable or warrantable, for it might not only break an abscess where it ought not to be opened, but instantly suffocate the patient, especially if he is much enfeebled.

1390. But vomiting not only promotes the circulation through the abdomen, and stimulates it's viscera, but proves in some degree an excitement to the whole nervous system; and partly by this stimulus, partly by the great retchings and agitations which it produces, quickens the pulse, accelerates the circulation, often effecting at the same time an equal distribution, removes congestions or irregular distributions, promotes the secretions and excretions, especially sweat or perspiration, and increases the action of the absorbent vessels (1347.). Hence it is often beneficial in general languor or torpor, palsy, insanity, amenorrhoea, obstructed perspiration, certain discharges of blood, apoplexy, or dropsy of various descriptions, &c.

1391. It is of great advantage in almost all fevers, especially at the commencement, while there is nothing to hinder it's being prescribed at any stage, provided the condition of the patient require it. So great a benefit from vomiting in such diseases is not to be attributed to the stimulus communicated to the nervous system, nor to the accelerated circulation, which was possibly already in excess, nor indeed does it seem hitherto well ascertained or understood. Some are of opinion that the proximate cause of fever consists eminently in a spasm or powerful and almost insuperable contraction of the extreme vessels, particularly of the skin, and that the only way in which vomiting operates in that state is by relaxing that contraction and anew facilitating the circulation through the minute and extreme vessels. This effect they are supposed to produce by some astonishing sympathy, evident though very difficult to explain, between the stomach and the skin, so that the affection of the former effects a great alteration in the state of the latter,—unbracing and relaxing it, facilitating the perspiration through it, perhaps also inducing sweat, rendering the action of it's vessels more intense, and effecting a greater determination of the blood to it; thus restoring a free, equal, natural, and gentle circulation all over the body.

1392. However obscure and uncertain a great part of this doctrine may be, this at least is certain and evident, that in almost every fever, especially in it's commencement, the skin is dry, so that there can remain no doubt that the perspiration is greatly checked, and that afterwards, in the decline of the fever, it becomes moist and soft; also that emetics, seasonably administered, often produce such a state of the skin, with a striking and sudden alleviation of the whole disease, so that it is probable enough that the nausea and vomiting, in a great measure at least, are the cause of such a benefit.

1393. But this is by no means the only way of accounting for the beneficial effects of emetics in fevers, nor does the use of them depend on the opinions concerning the causes of fevers: for they are often of the greatest utility in other ways not at all doubtful; they relieve the stomach, which very seldom escapes being disordered (655.) if oppressed with noxious fulness, and thus remove the natural nausea and vomiting (675.), abate anxiety (191.), allay headach (657.), preserve the strength, which would otherwise be quickly exhausted (380.), sometimes procure sleep (396, 401.), and generally protect the patient from the severe and very injurious diarrhoea (663.) which frequently attends diseases of that description.

1394. It is worthy of remark that emetics are of such advantage in fevers, that they sometimes carry off, in the speediest manner possible, even the most violent, and prevent or repel some of the very worst description, when threatening or already making their attack; they are also of frequent and great advantage though taken in so small a dose that they only produce nausea, without any vomiting; hence it is quite evident that their good effect does not depend solely on the evacuation of the stomach, and it's beneficial consequences (1391.), but partly on other modes of operation.

1395. But we must guard against the very dangerous mistake concerning the use of emetics in the treatment of fevers, into which many practitioners seem to have fallen, who apply them almost indiscriminately in all fevers, as if they were always proper and attended with no danger and inconvenience. That this is a gross mistake experience has more than proved; for emetics are often not without danger, nor are their inconveniences always of the slightest kind, whether tried in the beginning of fever, while there is a plethora, and great impetus of the blood, perhaps towards the head,—or toward the end, when the patient's strength has been impaired and almost exhausted,—or, when too frequently repeated during the whole course of the disease, they have wasted too much that strength which disease had spared. Wherefore it is neither proper, in violent fever, to give an emetic till blood has been abstracted in sufficient quantity,—nor in very great debility to make trial of so violent a remedy,—nor to repeat it often when it has yet been ineffectual, since it does not always carry off fever, but cannot fail greatly to weaken the body.

1396. Emetics have also a good effect in many affections of the stomach and intestines, as in nausea, vomiting, hiccup, diarrhoea, dysentery, &c. partly by expelling some acrid and diseased matter, which either produced or aggravated the disease,—partly by the equal flow of the blood and of the nervous energy, and the free perspiration which it produces,—and sometimes perhaps by inverting the motion of the stomach and superior part of the intestines, so as to repress, at least, or perhaps invert the excessive or accelerated motion of the other part of the intestine.

1397. They are supposed by some to possess an antispasmodic quality, not only in every kind of fever and disease of the intestines, but also in real convulsions of the large muscles of the trunk of the body and limbs. Perhaps they may sometimes have a good effect on these, either by their great stimulus and agitation of the system, or by the new and more salutary distribution of the blood and nervous energy which they effect; or when such convulsions originate in disorders or irritations of the stomach, a case by no means rare, it will easily be seen by what means vomits become beneficial.

1398. Frequent vomiting is very injurious to the body; particularly it greatly weakens the stomach, of course spoils the digestion, and thus becomes in some measure necessary. It also exhausts the strength, and produces too great a congestion of blood in the head, or determination to it.

1399. Unless in very urgent cases, this evacuation, like all the others, ought to be avoided, not only in patients of great weakness and irritability, but also in those whose neck is long and throat rather narrow, seeing such persons vomit with difficulty; also in great fulness of blood, especially if there is any congestion in the head or increased impetus towards it; or, when it appears necessary in such a case, blood is to be previously drawn. Also, in inflammation of the stomach and intestines, colic pains, or in protracted and obstinate costiveness, vomiting is always dangerous, for reasons sufficiently manifest.

1400. It is much safer than at first view might be supposed in cases of pregnancy, or phthisis, or in haemorrhage,—from the nose, the lungs, the stomach or uterus,—and often safe and necessary in the most violent headach, which not unfrequently proceeds from the state of the stomach.

1401. The operation is more easy with a full than with an empty stomach; hence it is attempted generally in the evening, more rarely in the morning. But when we expect any benefit from the agitation or stimulus of vomiting, it will not be improper to try it in the morning, when the stomach is nearly empty.

1402. When it is an object to have the stomach thoroughly evacuated, it is convenient and generally necessary to drink largely, so as to fill and distend it (1367.), that the vomiting may be the more copious, easy, and prompt. But it is necessary to guard against drinking too much, for in some cases this prevents the evacuation altogether; and occasions great oppression, anxiety, and pain, severe and cruel retchings, perhaps considerable danger, from the stomach being too much distended, and possibly a constriction at the same time at both it's orifices, so that nothing can be ejected. In general, adults may with safety and advantage drink one or two pounds of proper liquid (1403.) to promote vomiting: but it is seldom proper to drink to the extent of three pounds or more, unless what had been previously drunk has, in part at least, been already rejected. In general, children will not drink, nor is there any occasion to compel them, because, for the most part, they vomit with the greatest ease without such assistance.

1403. For promoting vomiting, it is much better to administer drinks which gently stimulate, such as infusion of camomile flowers, of centaurea benedicta, horseradish, or water mixed with a little powdered mustard or ammonia, than pure tepid water; because the latter, being milder, a larger quantity is requisite, and the stomach is more weakened and hurt by the greater and more protracted distention, and the relaxing power of the tepid water.

1404. It is seldom necessary to give any medicines for resolving, attenuating, or rendering the contents of the stomach more easily ejected; though sometimes, indeed, that organ is loaded with so glutinous and tenacious a matter, that common medicines do not answer, and, of course, more powerful ones are necessary, which are much more to be trusted than any solvents.

1405. But besides that, and similar states of the matter present in the stomach, there are also certain conditions both of it and of the whole body, that render the effect of this class of medicines very uncertain; such are torpor, whether partial or general, and that unknown condition of the nervous system which occurs in insanity.

1406. Though it is not unfrequently proper to repeat vomiting several times, it is necessary to guard against the idea of repeating it till nothing morbid is discerned in the matter evacuated. For in many cases, as in those who are affected with glutinous matter, or acidity in the stomach, or in intermittent fever, much morbid matter will be found, though vomiting be repeated every day, or frequently in one day. Nay more, too frequent vomiting, by enfeebling the stomach, and injuring digestion, often seems to produce such morbid matter.

1407. It is often of advantage, especially in very infirm patients, or those who have been much agitated, to give an anodyne after vomiting, to compose such agitation, procure sleep, and recruit the strength. Such a medicine also given in these circumstances greatly favours sweat, which the vomiting usually provokes.

CHAP. XXXV.

Of cathartic remedies.

1408. REMEDIES which excite the alvine evacuation, are called Cathartics. A great variety of these are in use, drawn from very different substances, and very well accommodated to the varied conditions of the patients. For some of them are so mild, that they agree only with the very weak and delicate, and have no effect on those who are more vigorous; others are so acrid and violent, that even to the most robust, they must be administered sparingly and with great caution. Some greatly excite and heat the body, others evidently cool it, and check irregular motions. Some therefore are adapted to ardent fever, or severe inflammation, others to palsy or dropsy; some again are proper in putrid diseases, others in morbid acidity; some operate slowly, others quickly; some leave the bowels costive, others are understood to leave them rather relaxed; some operate with severe pains and gripings, others almost without pain; some with great stimulus and irritation have but a sparing and uncertain effect, others with little or no irritation effect a most copious evacuation; some, in a word, stimulate chiefly the superior, others the inferior part of the intestines.

1409. The mildest remedies of this class are sugar, and many things which contain something of a saccharine nature, whey, wort, mild beer, many ripe and sweet fruits, honey, manna; many bland and mild oleaginous substances, as oil of olives, or of almonds, fat broth, castor oil, which, by the by possesses far greater powers than mere oils, soap also and sulphur; many acid or acescent substances, subacid fruits, tamarinds, the greater part of esculent vegetables, butter milk; the supertartrite of potass, many neutral salts, as the sulphate of soda, &c. magnesia, which is possibly reduced by the acidity present in the stomach to the form of a salt before it become a cathartic; many medicinal waters, chalybeate, sulphureous, saline, or sea water, so that some authors have not hesitated to class water itself, though simple and sweet, among the milder cathartic medicines. In fine, certain herbs, as pale roses, or violets; but the powers of these are extremely feeble, trifling, and uncertain.

1410. The above (1409.) are accounted refrigerants, but the following are stronger and more heating; namely, white mustard, rhubarb, senna, seneka, aloe, guaiacum, jalap, turpentine, certain warm gums, ammoniacum, galbanum, &c. and, as some think, inspissated bile, and other bitter medicines, but in these little confidence can be placed. In fine, some medicines already mentioned among emetics, as ipecacuanha, or the tartrite of antimony, may also be enumerated here.

1411. The following are still more acrid,—the purging buck-thorn, black and white hellebore, scammony, elaterium, gamboge, and many similar substances, which it is not necessary to enumerate. Along with these acrid medicines derived from vegetables, some preparations of metals, particularly of mercury and of antimony, deserve to be enumerated. All these, though taken in small quantity, powerfully irritate the intestines, and excite purging, often with severe gripes, and not unfrequently attended with violent vomiting (1383.). They also quicken the pulse, heat the body considerably, sometimes disorder it in a surprising degree, and sometimes do serious injury, especially to the intestines and contiguous parts; so that of late many of them are not undeservedly either seldom prescribed, or entirely out of use. Nor is discussion necessary for the conviction of every medical man, what prudence is requisite in the administration of them; if, at any time under the pressure of existing circumstances, it should be necessary to have recourse to such medicines.

1412. The salutary effects of purgative medicines are manifold; and by a thorough knowledge of these, their use in various diseases will be readily understood.

1413. In the first place then, they suddenly and effectually empty the intestines, and in some measure even the stomach. Hence they are evidently of good effect, when these viscera are either oppressed with an excessive load; or hurt and irritated with too acrid matters, as by putrid or acid aliments, hardened faeces, extraneous bodies, calculi formed, or worms bred in them. Some of these may be suspected from a costive habit, gripes, or inflation of the belly, tenesmus, indigestion, often in diarrhoea (663.), and more certainly still in dysentery (668.), and in colic.

1414. But the operation of purging, especially when full and strong, not only expels all the contents of the intestines, but, by the stimulus of the medicine applied to them, and of the powerful motion excited, promotes and increases the secretion and flow of all the humours which are poured into them, as their mucus and other juices, the bile and pancreatic juice; and at the same time effects a greater determination of the blood and nervous energy towards the abdomen, promotes the circulation through all it's viscera, and carries off much thin fluid from the blood; thus it becomes a general evacuation, takes off every where the tension of the blood-vessels, and of course moderates the impetus of the blood, abates the other secretions and evacuations, excites and augments the action of the absorbents, and greatly weakens the body. But if the medicines employed have been of the more acrid and heating description, they powerfully stimulate the whole system.

1415. Hence it will be readily admitted, that in almost innumerable diseases, and of very different kinds indeed, purging may prove of great advantage, provided it be duly and prudently conducted; and particularly in various obstructions of the abdominal viscera, jaundice, torpor, either general or of the intestines only; in many diseases of remote parts, as of the head, palsy, apoplexy, epilepsy, insanity, phrenitis, headach—a disorder arising from a multiplicity of causes, in every species of which, it is of great importance to keep the bowels open; also in every case in which there is a superabundance and excessive impetus of the fluids, and where a great and speedy evacuation is necessary, as in disorders proceeding from the suppression of customary evacuations, in various fevers, many inflammations, discharges of blood, small-pox, measles, &c.; in dropsy also for drawing off the water, by increasing the action of the absorbents, and in an excessive and morbid flow of sweat, urine, or saliva, in order to check these evacuations. In many diseases indeed of this kind, purging must be attempted with caution, and not unfrequently avoided, being, for reasons sufficiently manifest, neither equally suited to every case, nor to every stage of the disease.

1416. It usually produces the best effects on full, gross, corpulent habits, on those who use a full diet and little exercise, or children, for instance, whose bowels, naturally more open, have from some cause or other become too costive; or, if it prove not so beneficial, it at any rate does less hurt to patients of this description, who generally bear with ease such an evacuation.

1417. Purgatives were formerly, and by many still are supposed to be most useful, and almost necessary early in the spring, when plethora, if it be present, shews itself by the most manifest symptoms. But of such use of medicines enough has been already said (1352.). It is however equally consistent with reason and fact, that a moderate use of purgatives is more necessary in warm seasons and countries than in cold.

1418. It was long the established custom, and hitherto, indeed, neither have all practitioners, nor the people at large, relinquished it entirely,—after many acute diseases to give a purgative medicine, and, in some cases, to repeat it several times: than which, no practice could well be devised more destitute of utility, or, in most instances, more pernicious to the body, already too severely purged, and exceedingly weakened. But if sometimes in the decline of an acute disease, when it's more urgent symptoms are removed or alleviated, some troublesome ones should still remain, and require such a remedy, there is nothing to prevent it's being administered: as after small-pox or measles. Such necessity, however, is far more rare than is commonly supposed, and has a very different cause.

1419. The operation of cathartics is dangerous to the weak, the irritable, the slender,—and, as is alleged, in cases of phthisis, of pregnancy, or of parturition: to females also, (equally with all other evacuations, at least such is their settled persuasion) during the flow or approach of the menses; and, in short, to those afflicted with haemorrhoids, or obnoxious to them; especially if the medicine employed be of the more acrid description, as aloe, which dissolving slowly, carries it's acrimony with it to the anus. It is also to be attempted with great caution, even by the gentlest medicines, in inflammation of the stomach or intestines, or when these are in a delicate state, as in dysentery, or protracted diarrhoea.

1420. Too frequent repetition of purging, though at first necessary, does great injury, both to the whole system, which it weakens exceedingly, and especially to the intestines themselves, which it sometimes renders preternaturally feeble, tender, and irritable, but more frequently torpid and slow; whence proceeds constipation, and a necessity of now and then opening the bowels by medicine. It also renders the blood itself thin and pale, in the same manner as too frequent blood-letting.

1421. In the use of purgatives, due allowance must be made for the patient's idiosyncracy, not only in regard to the nature of the medicine, but also to it's quantity, mixture, preparation, and the time of taking it.

1422. Purgatives are conveniently taken, either at bed-time, or early in the morning, according as they are more prompt or slow in their operation.

1423. It is often of advantage not to take the whole of the medicine at once, but by little and little, in equal portions, at proper intervals; for, by this means, neither is the stomach unnecessarily loaded, nor does vomiting come on, too large a dose is avoided, and the intestines are not so severely irritated, while the effect is more easily, and, indeed, more certainly produced.

1424. Medicines which are taken in a liquid form, either completely dissolved, or diluted with a great portion of water, usually operate with more promptitude, ease, and certainty, than such as are swallowed in a hard, or at least in a solid form.

1425. Wherefore, when the more solid cathartics are given, especially if they be at the same time of the more acrid description, they must be diluted with a large portion of thin and weak drink, such as water-gruel, whey, light broths, or the like. In this way, the medicine is either dissolved, or well diffused through the intestines, does them less injury, is attended with slight gripes, or none at all, and produces the most copious stools. But it must by no means be diluted when we expect any benefit from the stimulus and irritation of the medicine; as in dropsy, in which cathartics are administered, not so much for the purpose of purging the bowels, as of exciting the system, and increasing the action of the absorbents.

1426. In severe and protracted constipation, we must not trust so far to medicines given by the mouth, which are not without their peculiar danger (1419.), as to neglect to open the bowels by proper injections; an operation attended with no danger, and which renders the action of medicines more safe and easy.

1427. When there is a tendency to nausea or vomiting, it becomes necessary, not only to give the cathartic in small portions, but along with it, or a little before, to try an anodyne, or what commonly answers best, to give such a medicine by way of clyster, for composing the agitation of the stomach, that the purgative may be retained, which would otherwise be speedily rejected.

1428. It is also of advantage in many cases, as in great pain, or long watching, to give an anodyne along with a purge, not for the purpose so much of impairing it's action, as of rendering it slower.

1429. In cases of great debility and irritability, it is often of advantage to give an anodyne after purging, in the same manner as after vomiting, and for the same reasons.

1430. During the operation of cathartics, patients are very easily injured by cold, possibly not more by reason of the body being then weakened, than on account of the current of fluids being drawn off more than usual from the external parts, and determined towards the internal; it is therefore proper at such a time to guard carefully against cold.

1431. The method of opening the belly by means of lotions or clysters, is often preferable, in no small degree, to that of purging by medicines taken by the mouth.

1432. The moderate evacuation of the bowels by clyster, is found to be a more prompt and sure, a more easy and mild remedy than active purgation; and, therefore, agrees better with the infirm and irritable, especially when the intention is not so much to purge as to relax, which is often necessary when a more copious purging would be very pernicious. But the effects of a medicine taken by the mouth are so uncertain, that in one patient it does not affect the bowels in the least, while it purges another with the greatest violence.

1433. On the other hand, clysters injected by the anus have sufficient effect in emptying the larger intestine; partly by their stimulus, if they be acrid, which excites it, accelerates it's motion, promotes the secretion and flow of the humours that are poured into it, and induces a desire to go to stool; partly also by softening or diluting the faeces when too hard, and by fomenting, moistening, and besmearing the channels of excretion, that the discharge may be the easier.

1434. For this purpose practitioners employ tepid water, many emollient decoctions, mucilaginous medicines, and almost all cathartics, from the mildest to the most acrid, according as a gentle or more active stimulus is requisite. The smoke of tobacco is supposed to communicate the most powerful stimulus to the intestines; but as already explained (1375.), it has it's inconveniences, and these are not slight. For the most part, a quite safe and sufficient stimulus may be given by injecting the mildest substances in such quantity as to distend in some degree the large intestine. Sometimes such a quantity of water has been injected by a proper syringe, that it has not only filled the larger intestine, but having overcome the resistance arising from the imperfect valve of the colon, it has entered the smaller intestine, ascended through it to the stomach, and been vomited. But this, for very evident reasons, is not to be hastily attempted. The old remedy of distending the intestines by blowing air into them with a pair of bellows, did not differ widely from this method.

1435. But clysters have a good effect, not only by evacuating the contents of the large intestines, but by fomenting this and the contiguous parts as with a warm bath, relaxing and relieving them from spasm, if any be present, and facilitating the circulation through the lower part of the abdomen. Hence they are useful in pains arising from colic, or calculus, in strangury, &c. in inflammations and other diseases of remote parts, as of the head or chest; and indeed in all, or at least the greater part of diseases, that are relieved by purgative medicines taken by the mouth.

1436. It may also be here observed, that besides cathartics, there are many medicines and other things which produce nearly the same effects on the body when injected by the anus, as when administered by the mouth; so that medicated clysters are deservedly much employed. For, in this way, nutritive matters, diluents, refrigerants, anodynes, corroborants, antiseptics, stimulants, &c. are often conveniently administered, when they could not be given any other way. For, in the inferior part of the intestines, no less than in the superior, are many nerves and very acute feeling; nor is there any deficiency of absorbent and lacteal vessels.

1437. It is often necessary to begin with a common clyster for the purpose of evacuating the large intestine, so that the medicated one may be injected after the other has returned. Those intended to be retained ought not to exceed a few ounces, lest by distending and irritating the intestines (1434.), they be quickly rejected.

1438. Injections are generally thrown up in a tepid state, that they may not injure the intestine, either by their heat, or their cold; but nothing forbids to use them very cold when circumstances require it.

1439. The too frequent use of injections, or of those of too acrid a character, is attended with injurious effects, for the same reason as in the case of cathartics, or too acrid medicines given by the mouth (1420, 1411.).

1440. Purgatives are sometimes introduced into the anus in a solid form, and when administered in this manner, they are termed Suppositories. Their effects, whether good or bad, may be easily understood from what has been already observed (1432, 39.). They are, in some cases, administered with good effect for those small worms called Ascarides, which usually lodge in the lower part of the intestines: sometimes also to promote the haemorrhoidal discharge when unseasonably suppressed, or when some benefit is expected from it's return. But it is not the least inconvenience attending these, that they sometimes unseasonably induce that discharge, which is neither useful nor safe for every patient.

1441. It has on some occasions been observed, that the odour and volatile parts of certain cathartic medicines, prove speedy and powerful laxatives to some persons of a more delicate habit; and it is alleged that some savage nations commonly use no other purgatives. But practitioners cannot trust to this. Some have asserted that certain medicines have sometimes purged children effectually when their bellies have been well besmeared with them ; and possibly this mode might sometimes be of use.

1442. In the case of gripes, whether the effect of previous medicine which has produced no stools, or spontaneously proceeding from a morbid state of the intestines, it has often no small effect, in relaxing the bowels, to foment the abdomen, or perhaps the whole body, with water or other matters warm. This indeed ought not to occasion the least surprise, since heat has such power in relaxing our bodies and relieving spasm.

1443. There remains yet another method of relaxing the bowels, by no means certain indeed, but which has not unfrequently succeeded admirably, and cured many whose case was almost hopeless. This is nothing else than suddenly to dash cold water on the lower extremities. For so great is the sympathy subsisting between the feet, or other lower extremities and the intestines, that some persons are almost instantly seized with a looseness if they have but stood a little on a cold pavement, got their feet wetted, or cold from any cause whatever. But when cold is suddenly and unexpectedly applied to the feet and legs, the effect in relaxing the bowels will be still greater, when not only the nervous sympathy between the external and internal parts, and altered course of the blood, but at the same time a great and general stimulus contributes to the effect. It seems, indeed, a harsh remedy, not to be tried on every slight occasion, but not at all dangerous, and of course it ought not to be neglected in urgent circumstances, and when more usual remedies have failed.

CHAP. XXXVI.

Of diuretic remedies.

1444. THOSE remedies which excite the discharge of urine, are called Diuretics. A great number of medicines, indeed, and other remedies, possess such a property, as is fully proved by almost innumerable observations, and not a few experiments made with the very design; and there is no doubt, that by the help of such remedies, many have completely recovered from the severest diseases. It is however an undoubted fact, and matter of the deepest regret, that their effects are so uncertain, that no practitioner can promise that in any one case he can, by any medicines, produce a discharge of urine; for oftimes those which are justly esteemed the strongest, do not produce the smallest discharge.

1445. That their action may be the more easily understood, it must be recollected, that the excretion by the kidneys consists of much thin fluid, of almost all the salt in the blood, which otherwise would quickly be in excess, and of much corrupted and acrid matter of different kinds.

1446. Hence, it is not difficult to conclude, that much thin drink, various salts, and many acrid medicines taken into the body, will provoke urine. And, in fact, all the more powerful diuretic medicines are either diluting drinks, some salts, or various acrid things, which being conveyed with the blood to the kidneys, stimulate them and excite them to a secretion more copious than usual. Some indeed imagine, that a proper stimulus applied to other parts at a considerable distance, such as the intestines or skin, may be communicated to the kidneys in such a way as to produce a discharge of urine; and it is fully evident, that in some instances, something of this kind takes place.

1447. The action of salts too, and of all acrid medicines, is greatly promoted by drinking diluent liquids in abundance. In certain diseases, however, this is not always proper, and, in many cases, it is still less proper to give diluents only to provoke urine; for though these sometimes augment the quantity of urine more than the portion of drink which was taken, and so become in reality diuretics, that result is not uniform; and if it be otherwise there is nothing gained; while, in the meantime, such a quantity of drink is not without it's inconvenience, or sometimes a degree of danger.

1448. It must be observed that the action of all diuretics, equally of diluents, salts, or other acrid matters, depends greatly on the temperature of the body, or it's exercise or rest; for all heat and violent exercise have a decided effect in promoting perspiration and sweat, and proportionally repress the urinary discharge; while cold, and lighter exercise in cold air, have a quite opposite effect: whence it happens, that almost all diuretic medicines are capable of being administered in such a way, that instead of urine, they may induce sweat; and almost all those usually prescribed for inducing sweat, may sometimes provoke urine.

1449. With respect to the several diuretic medicines, they are so numerous, that they cannot well be particularised; it will therefore suffice to enumerate the principal kinds. Among the first of these comes to be noticed simple water, and almost all kinds of drink, though very mild, as whey, many infusions of herbs and other vegetables, and many medicinal waters, not at all of an acrid nature; but drinks, which possess some acrimony, are evidently more efficacious than the former, such as small brisk beer, and indeed all beer when it is become old and inclining to acidity; many harsh wines, such as the Rhenish, also our country beverage punch, and the like.

1450. Salts of every kind have some diuretic effect. Of the acids, however, those from vegetables, as the acetous acid, or lemon-juice, are most in use; and the fossile acids are seldom prescribed; though there is no doubt that one of them at least the nitrous, possesses a similar quality: the succinic acid is also much recommended by some, and the supertartrite of potass is with great propriety very frequently administered. Of the alkaline salts, potass and soda are more frequently prescribed as diuretics, especially soda, the powers of which are believed to be considerable, but they are not certain; ammonia, as it stimulates the system too much, and procures sweat, is seldom given as a diuretic. All neutral salts have some effect, but the acetite and nitrate of potass are perhaps the best; some recommend the muriate of ammonia, the sulphate of potass with sulphur, and the solution of the acetite of ammonia. Here too should be classed those medicinal waters which contain some portion of neutral salt.

1451. Among diuretics must be reckoned many acrid plants of various kinds; as white mustard, horse-raddish, garlic, squill, carrot, broom, seneka, pareira brava, meadow-saffron, foxglove, tobacco, and wild lettuce, &c. Also many balsams, or essential oils of plants, have a similar property; as turpentine, oil of juniper, &c. Also not a few bitters, and these real astringents, as uva ursi, are by some referred to this class; but the qualities of these are not well ascertained.

1452. Some stimulating medicines derived from the animal kingdom, as millepedes, cantharides, &c. are always mentioned among diuretics; and, it is certain, that cantharides prove a very active stimulus to almost all the urinary organs, not without considerable inconvenience, or even danger, when incautiously administered. But they are nevertheless very far from proving an effectual diuretic, and are therefore seldom ordered with this intention.

1453. Though many very acrid stimulants are derived from metals which might possibly be so administered as to provoke urine, such medicines are scarcely numbered among diuretics, and few of them are employed with that intention. Mercury, however, has a claim to be mentioned here, not for any specific power which it possesses of irritating the kidneys, and exciting urine, but because, by stimulating the lymphatic system, a greater quantity of thin fluid is absorbed and taken into the blood to be conveyed to the kidneys. Besides, it proves a stimulus to the whole body, and especially to the organs of secretion, and may without difficulty be directed in such a way as to excite some of them more than the rest. As commonly administered, indeed, it affects the urine but seldom and sparingly; the sole reason of which seems to be this, that in general all who use it are kept unusually warm, or at least are carefully defended from even the slightest degree of cold. But were the body exposed to moderate cold, or at any rate were unusual heat avoided during the use of mercury, in that case it would often provoke urine in a very considerable degree. But this effect becomes still more certain, when it is not given alone, but along with some other medicine, squill for instance, which may direct it to the kidneys. Such composition and combination of medicines affords a diuretic remedy perhaps the most powerful of all that have yet been discovered.

1454. Lastly, among diuretics, it is necessary to mention common and sweet oil, which, as a respectable author affirms, and abundant experience proves, may be applied so as greatly to promote the discharge of urine; namely, if the belly be anointed and well rubbed with it. It is rather difficult to account for this fact: the oil itself can communicate no stimulus at all to the body, and the friction very little; and, it is scarcely credible, that oil applied to the skin should impede the perspiration to such a degree, as to increase the flow of urine. It is known that frictions, especially with oil, exceedingly increase the action of the absorbents, and, in some cases, discuss in a short time great swellings of the limbs of dropsical patients; and it seems very probable, that the great flow of urine which almost in such patients alone is observed to attend frictions with oil, is, in great measure at least, the effects of the water taken up anew and conveyed to the kidneys.

1455. The effects of diuretics are simple enough, and no way difficult to be understood, but various according to the nature of the different medicines administered. From the enumeration of these it is sufficiently clear, that some of them are decidedly heating, others refrigerant; some considerably increase the acrimony of the urine, others diminish and blunt it; so that it is quite evident that all of them cannot be equally adapted to every disease.

1456. The most general effects, however, of all this class of medicines, and of the evacuation effected by them, are nearly as follows: they remove whatever impediments or obstructions impair the secretion and excretion of urine; by increasing the quantity, they thoroughly wash it's passages, the kidneys, and the bladder; they carry off the thinner parts from the blood, and by consequence render it thicker; they diminish the quantity of the circulating fluids, and therefore moderate their force; they effect a greater determination of them to the kidneys, and of course less to other parts; they check the other secretions and excretions, such as perspiration, or the alvine evacuation; and, in a word, promote and increase the action of the absorbents.

1457. Hence it will readily be understood, that diuretic remedies of different kinds will often have a good effect in cases of dropsy, and calculi, especially when these are yet very small and detained in the kidneys only; in cases where the urine is in too small quantity, and the secretion or excretion of it impeded or obstructed by various causes; and in those where the blood is too thin and watery. Perhaps it is rather owing to plausible reasonings than to experience of the fact, that they are reported to be sometimes of use in excessive sweatings or relaxation of the bowels; in an excessive quantity or impetus of the blood, as in ardent fever, or irregular distribution; also in many diseases of parts remote from the kidneys, as of the head, or of the chest, which perhaps depend in some degree on the blood being accumulated in them or determined to them. They are also said to agree very well with those patients whose case requires some evacuation, while yet, by reason of weakness or other causes, they are not able to bear evacuations of a more active description. But all these assertions want confirmation; and though there is no doubt, that in some instances, fevers and inflammations, perhaps also some other diseases, have been carried off with an unusual discharge of urine; it is by no means ascertained that this was the cause of the cure, of which it would rather appear in many cases to have been the effect; and it is still less decided, whether a great flow of urine brought on by art, ever produced similar effects in such diseases.

1458. Certain medicines enumerated among diuretics, such as diluents, which render the urine at once more copious and mild, are often of considerable benefit in various irritations or disorders of the urinary passages, proceeding from calculus, inflammation, ulcer, virulent gonorrhoea, or the defect or morbid condition of the natural mucus. But a benefit of this kind is evidently to be attributed to their demulcent (1301.), rather than to their diuretic qualities (1449.).

1459. Though diuretics are rarely given in such a way as to do the system much injury, it is nevertheless very evident, that some degree of prudence is requisite in the administration of them; the abuse of them being attended with considerable danger, as some have found from experience, whether they had been given of too acrid a quality, or too often repeated. For in this manner the whole body is greatly weakened; and, in particular, the kidneys are so injured, that either through torpor, they become inadequate to their functions in future, or being softened and relaxed, they excern an excessive quantity of fluid, and that very different from healthy urine. This kind of disorder called Diabetes, (734.) is sometimes very troublesome, and very difficult to cure. But concerning this bad effect of diuretics nothing is yet ascertained by decisive observations. Besides, the irritation of more acrid medicines may seriously injure the urinary passages and bladder, and deprive them of their mucus; whence comes perhaps strangury (741, 2.) and similar complaints, especially in aged people, who, by the course of nature, also become very obnoxious to disorders of that kind.

CHAP. XXXVII.

Of diaphoretic and sudorific remedies.

1460. THOSE remedies which promote insensible perspiration, are called Diaphoretics; and such as procure sweat, Sudorifics. But these two classes of remedies are very closely connected, and scarcely, if at all, admit of being separated or distinguished; since the same means may, by the mode of administration, produce either the one or the other effect; while these effects differ rather in magnitude and appearance than in reality.

1461. With regard to their action, it must first be observed, that it remains yet very doubtful whether there exist any medicines possessing any specific quality of stimulating the skin, or exciting to more vigorous action the vessels which exhale the subtle vapour, or pour out the sweat. Nor in fact is there place here for the circumstance mentioned (1446.), as established concerning some diuretics and the kidneys; for general stimulants received into the body have no such direction given them to the skin, as to affect it more than other parts of the body.

1462. Therefore, the excretion by the skin, with which we may connect the exhalation by the lungs, as being either of the same, or of a very similar nature, is promoted in another, and that a very different manner, by various medicines, the use and action of which will be readily understood from what was formerly observed (709, 726.) concerning sweat and perspiration. For much fluid is always passing off by the skin, especially if it is kept warm, the more freely and copiously—the more it abounds in the blood; and a quicker circulation, whatever occasions it, generally promotes excretion by the skin, unless something unusual oppose it. Besides, whatever unbraces and relaxes the skin, and opens it's pores, greatly favours sweat; and, in a word, by reason of that striking sympathy which subsists between the skin and certain other parts, particularly the stomach, certain affections of the latter, as nausea and vomiting, promote perspiration, and indeed frequently induce sweat; partly perhaps by the increased action of it's vessels, and partly by the relaxation of it's texture, so that it presents less resistance to the exhalation of the fluids.

1463. Farther experience fully proves, that the medicines which possess the greatest and most decisive power in promoting this excretion, are either diluents, stimulants, sedatives, emollients, emetics, or such various compositions and combinations of these medicines, as in many cases, for different reasons, have more effect in procuring sweat than any simple medicines.

1464. Of the diluents beside water, we may administer almost every weak drink for promoting sweat; as whey, gruel, or barley-water, and many decoctions and infusions of herbs.

1465. But thin, and at the same time somewhat stimulating drinks, such as sack whey, punch, in general all fermented liquors, or such as have a small mixture of some stimulating medicine, generally have still more effect than the former.

1466. Many salts, not only those which are accounted stimulants, but even those which prove the best refrigerants (1228.), ought also to be enumerated here; such are the vegetable acids, as the acetous acid, lemon juice, the nitrate of potass, &c. The effects of vegetable acid in procuring sweat are indeed but feeble and uncertain; and the use of it is entirely owing to an opinion not well established, but formerly received among medical men, concerning some property which they were pleased to ascribe to it, of dissolving and attenuating the blood; of late, however, both the opinion and the medicine have become almost obsolete. But by many physicians nitrate of potass, and by almost all the solution of the acetite of ammonia, &c. are daily prescribed, and seem to have some effect both in cooling the system, and on some occasions in promoting sweat. But however these and similar medicines are extolled as diaphoretics, they are little to be trusted unless they be given in a much larger quantity than usual.

1467. Potass is rarely given to procure sweat, nor does it seem at all a proper remedy; but ammonia is frequently given, and formerly was much more employed. The potass, if taken in a solid form, though it heat and greatly stimulate the body, often procures no sweat unless a great quantity of thin drink be taken along with it; it is therefore generally an advantage to take it already diluted with a large quantity of water or other proper liquid.

1468. Among plants almost all aromatics (1191.), and many other acrid ones, as contrayerva, guaiacum, seneka, serpentaria, sassafras, &c. and their essential oils, also camphor, and the like, are found useful for provoking sweat, especially when taken along with copious diluents. Thus also sarsaparilla, though of a very mild nature, often becomes a powerful medicine.

1469. Among the metals, antimony and mercury, which we have already frequently mentioned among stimulants and evacuants, and which we will yet have to notice once and again, are not unfrequently employed to promote perspiration; and sometimes they not merely promote a more gentle perspiration, but produce a very copious sweat. Antimonial medicines frequently have this effect, though they neither excite vomiting nor nausea; the sweat, therefore, which they produce, is not to be attributed solely to their emetic qualities (1462, 371.). Mercury too, when received into the body in innumerable and even very different forms, if in proper quantity, evidently increases the excretion by the skin, if no unusual obstacle stand in the way. It is, however, alleged, that as diaphoretics, certain preparations of it, such as the muriate of mercury, are greatly preferable to others which seem to affect other parts more than the skin.

1470. Among sedative medicines not only are some refrigerants (1466.) frequently ordered as sudorifics, the powers of which are very doubtful (1165.), and their effects neither certain nor considerable (1466.), but narcotics also, especially opium. This has sometimes been of eminent advantage as a diaphoretic, partly perhaps by relaxing the skin (1219.), and thus opening it's pores,—partly also by procuring sleep, or, at any rate, tranquillity to the patient, which greatly encourages sweat and relaxes the skin, by the natural heat of the body, and perpetual exhalations which are then accumulated around it.

1471. Emetics, especially antimonial ones, have considerable power, but by no means certain and uniform, of promoting perspiration, even when taken in doses too small for producing complete vomiting. But we have already elsewhere adverted to the reason of this, which is indeed very obscure.

1472. Some are persuaded that cathartics possess a similar property, and a few have not hesitated to class them generally among diaphoretics. The fact is evident enough as to some of them, such as guaiacum, turpentine, mercury, &c. which being naturally very stimulating and heating, may be administered in such a manner as to produce either the one or the other evacuation. Nor is it incredible that many of the more powerful cathartics would by their stimulus sometimes produce a twofold effect, namely, stools and sweat, as a judicious practitioner seems formerly to have experienced. Nay, they may sometimes produce sweat alone, without moving the bowels in the smallest degree ; particularly if they are given sparingly, or combined with some other remedies, or, in short, when the condition of the body, or a variety of external circumstances, are favourable to sweat, and counteract their purgative effects. The operation of purgatives too, whatever be the particular medicines employed, though at first sight it may appear very unfavourable to patients who wish to sweat, may sometimes be attended with benefit, as it relaxes the whole system, so as to facilitate the passage of the sweat through the pores of the skin. But if the mode of operation of particular medicines be not taken into the account, cathartics are far inferior to emetics in promoting sweat, and indeed are very seldom administered with this intention.

1473. Various combinations of the medicines already enumerated are usually more efficient in provoking sweat than the same separately administered,—the reason of which will, in some measure at least, be understood, if we recollect in how many different ways that evacuation may be promoted (1462.). But the effects of these compound medicines are much greater than the most discerning practitioners could have expected from the qualities of the simples of which they consist.

1474. Thus an emetic joined with opium induces sweat with much more effect than either of the two alone. And in general, of all medicines administered with this intention, the most effectual one consists of opium and ipecacuanha, with four times the quantity of a neutral salt. In this way neither is sleep procured, by even a considerable dose of opium, nor does vomiting for the most part attend the ipecacuanha, and a profuse sweat is commonly produced. And the composition itself, which many practitioners formerly slighted and rejected, is now, by universal consent, admitted to be of the utmost utility. It is alleged that cathartics, joined in a similar manner with opium, have sometimes no small effect in provoking sweat.

1475. Stimulants too, combined with opium, are not bad sudorifics, and for many centuries no other remedy was more in use than such a composition among physicians when they wished to produce sweat. Such are the Mithridate and the theriaca Andromachi, and some other remedies of the same kind. In number of ingredients, indeed, these appear in a ridiculous light, and are not unjustly accounted the disgrace of medicine and reproach of medical men; but in respect of their nature they are by no means absurd, for although they contain many useless and unsuitable ingredients, the aromatics and other stimulants and opium, are always distinguished, and, by their combined powers, form an excellent remedy.

1476. It is no small advantage in many cases, as in dropsy, to combine the power of mercury with other sudorifics. The best mode of doing this is to give it for some days before other remedies are administered, that it may thoroughly pervade the system, and affect the mouth in some small degree.

1477. In short, diluent medicines, if indeed such things deserve to be called medicines, are properly given, at least in most diseases, with almost all other sudorifics; especially when the sweat has broke forth, or perhaps after it has flowed for some time.

1478. But beside these and a great many other similar medicines, there are also other means of the greatest effect in procuring sweat. Of this kind are various emollient remedies, as the warm bath, fomentations, steam of water or of alcohol, and, finally, heat, whatever be the mode almost in which it is applied. In fact, these things, by their astonishing effects in relaxing the surface of the skin, are sometimes sufficient for producing the most profuse sweat, though no medicine has been taken inwardly. They are also frequently necessary, at least of the greatest use, before taking sudorific medicines, the effects of which they render more sure and safe, when otherwise these effects might be trifling or uncertain, and in some cases pernicious, namely, when no sweat is produced, but the body heated. In this manner too, a topical sweat is readily produced in a limb, for instance, while the rest of the body is little affected, in any case in which a universal sweat would be inconvenient.

1479. It must, however, be observed, that all heat, whether dry, or applied by bath, fomentation, or steam, not only relaxes the skin, but, at the same time, communicates a very powerful stimulus to the whole body, and particularly to the sanguiferous system, so that it evidently promotes sweat in two different ways. The same remark must also be made concerning the use of warm drink, which is frequently administered as a sudorific, either alone, or along with other medicines.

1480. To promote perspiration and induce sweat, warm clothing also contributes not a little, namely, such as proves an adequate defence to the body against cold, and duly absorbs the moisture of the skin, that it may catch nothing damp or chilling. On this account, a flannel shirt substituted for a linen one, often proves no contemptible remedy. For nearly the same reason, the cleanness of the clothing is also a matter of the greatest utility.

1481. Removal to a warmer climate is also a most excellent auxiliary in this case, as by this means, the excretion by the skin, which otherwise would be sparing, or in many cases entirely checked, is most effectually promoted during whole months, or for whole years, should occasion require it.

1482. It will appear, at first sight at least, very inconsistent, after all that has been stated concerning heat and other emollient remedies, to mention cold also among the remedies which are capable of promoting perspiration, or even of inducing sweat; nevertheless, such is the fact. Such an effect of cold indeed is by no means uniform, as it greatly depends on the state of the body to which it is applied; but in the case of the robust and vigorous, who can well bear it, it is often an excellent remedy. Thus, in many persons, a draught of cold water sometimes produces sweat, and the use of the cold bath promotes it in an uncommon degree. Nor are there wanting many observations which go to prove—and some individuals, who assert as their own experience, that cold air, provided it be dry, freely applied to the body, produces similar effects, especially when aided by proper exercise. Such effects of cold are evidently to be attributed to it's stimulating (1205.), —perhaps also to it's corroborating powers (1115, 28.).

1483. Among the most excellent and salutary diaphoretic remedies is deservedly reckoned proper bodily exercise. For when moderate, it eminently promotes perspiration; when more violent, it generally induces a profuse sweat, even in those persons who can scarcely, if at all, be compelled to sweat by the medicines commonly used. But such effect of exercise in promoting sweat, evidently depends, for the most part at least, on the acceleration of the circulation (428, 709.). But enough has been said already on the powers and uses of exercise (1103, 1114, 1206, 1208.). Also in cases which do not admit of exercise, diligent friction may in some measure supply it's place.

1484. Electricity, the stimulating powers of which have been already mentioned (1200, 1.), seems not a little to promote perspiration, and it is probable enough that it may sometimes be useful in this way; but in general when there is occasion for this evacuation, it is necessary to have recourse to more efficient remedies.

1485. In fine, the elevating passions possess a remarkable power of promoting perspiration; and there is not the least doubt that in this manner they sometimes produce the most salutary effects.

1486. But in regard to the effects of a copious sweat, or a more free perspiration, they will be readily understood from what has been said of the effects of other evacuations. This evidently lessens the quantity of the circulating fluids, abstracts their thinner parts, removes the obstacles that oppose the natural excretion by the skin, determines the fluids to the skin, produces an equal distribution of them in the internal parts, often relaxes spasm, moderates the impetus of the fluids, checks the other evacuations, promotes and increases the action of the absorbent vessels, softens and relaxes the skin, and, in a word, as medical men have always believed, expels more promptly and effectually certain noxious substances, naturally the matter of perspiration.

1487. It will therefore be easily admitted, that in various diseases, it will be no small advantage to promote perspiration and induce sweat; and particularly in those which proceed from obstructed or diminished perspiration, or in which this is preternaturally checked, which may generally be known by symptoms no way ambiguous, particularly by the stiffness or dryness and hardness of the skin, whether it be warm or cold ; and besides, is to be suspected from any known external cause of disease, such as catching cold. Instances of such diseases are,—various fevers, and other disorders of which fever constitutes a great part, catarrh, cough, rheumatism, and many other inflammations, some discharges of blood, phthisis, &c.

1488. This excretion also becomes useful whenever irregular distributions of blood take place, and seems to produce it's salutary effects in this way as well as in the former (1487.), in many of the above mentioned, and other similar diseases.

1489. It is also of advantage, for a very evident reason, in diarrhoea, or diabetes, or in various kinds of dropsy; in which, during sweating, there is not unfrequently such a sudden and copious absorption of water, that not only a profuse and protracted sweat, but a great discharge of urine takes place at the same time, by which that dreadful disease is sometimes completely cured.

1490. It is also beneficial in many chronic diseases, which chiefly affect the skin, as leprosy of various kinds, or lues venerea. In this last disease, whether it seize the external or internal parts, the promotion of the perspiration, or even in many cases the procuring of a profuse sweat, is an excellent remedy.

1491. A dispute has indeed been long and keenly maintained among medical men, with regard to procuring sweats in every kind of fevers ; nor is the question as yet so far decided, that it should be a settled point among them, when, to what extent, and by what remedies, such a method of cure is proper in fevers.

1492. It is agreed, however, that many fevers are very frequently relieved or carried off by natural sweat ; and there is no doubt that many remedies given to procure sweat, such as diluents, refrigerants, emetics, and especially antimonial medicines, are often of the greatest benefit to febrile patients, and either expel the disease entirely, or at least render it milder and safer; nor, in short, is it to be denied, that sweats have sometimes had good effects, when forced by much heat, and by the most powerful and heating medicines.

1493. But on the contrary, it is not less certain that even natural sweat, breaking forth in fever, frequently neither carries off nor alleviates the disease, and sometimes is very injurious to the patient; so that even natural sweat is not always to be encouraged. But that which is excited by artificial means, is a much more doubtful auxiliary, especially in the case of those who sweat with difficulty. For not only the more powerful sudorifics, but even those which seem the most gentle, such as warm drink, frequently prove not a little injurious to such persons, by injuring the stomach, undermining the strength, and unseasonably irritating and heating the body.

1494. With regard indeed to very stimulating and heating medicines, and heat applied in any way whatever, though sometimes they may have been attended with good effects (1492.), it is abundantly evident, that in fevers they are generally unprofitable, and often very pernicious. For they cannot always produce sweat, and though they may have succeeded in procuring it, perhaps the benefit is trifling, and at the same time, by their stimulus, they render the fever more intense, consume the patient's strength, and increase putrescence; they are almost equally injurious in very different kinds of fevers, though proceeding from various causes; especially in those which are attended with eruption on the skin. It is melancholy to reflect on the fatal effects to mankind of such a method of cure so long established, and so universally adopted. For it can scarcely be doubted, that a great part of the patients under fever, whom disease would have spared, have been cut off by remedies of this kind, in a way most deeply to be regretted.

1495. This evacuation, like the others, is frequently noxious, particularly to those much enfeebled or of great mobility, and indeed to all, when it is excessive, long continued, or too frequently repeated ; the body being greatly exhausted and unbraced, and the skin especially becoming so relaxed and delicate, that it cannot bear even the slightest cold without injury. For reasons sufficiently evident, it is ill adapted to children ; and to women in child-bed, to whom it was long supposed to be necessary, it is not only useless, but often very pernicious.

1496. In many diseases, such as lues venerea, gout, rheumatism, &c. such moderate and long continued perspiration as may be easily effected, either by proper medicines, exercise, clothing, or climate, has often a better effect than the most copious but short sweat excited by more powerful medicines ; and indeed the former has cured many who could have derived no benefit from the latter, which is by no means without it's peculiar danger, and which would sometimes prove most pernicious, as in phthisis, when a more gentle and uniform excretion by the skin would be of the greatest advantage.

1497. For the most copious, and frequently the most beneficial cutaneous excretion, may be effected without any sweat ; nor are we destitute of arguments which tend to prove, that sometimes more is exhaled in this way during a given time, than when the whole skin is wet with sweat. This doubtless not unfrequently depends almost solely on the relaxation of the skin ; but the insensible perspiration is rather forwarded by the vigour of the body, the impetus of the blood, and the action of the vessels on the surface of the skin.

1498. During the operation of sweating, much diluting drink is generally useful, and often absolutely necessary ; we must, however, diligently guard against loading the stomach by it's excess.

1499. In profuse and continued sweat, especially if the patient be very weak, he may be permitted, and frequently even ordered to take a little of some stimulating medicine, as fermented liquor, &c. both to support his strength, and to promote sweat.

1500. One who is about to sweat ought to throw aside all his linens, and the sheets of the bed, and wrap himself in woollen only. But if he will not follow such direction, then he ought to change his linen shirts now and then during the sweat, and put on clean ones, dry and warm (1503.).

1501. Endeavours should be used by proper fomentations, &c. to have the sweat completely extended to the feet; for sweats that are unequal, and only partial, seldom carry off any disease.

1502. We must guard against too much heat, either of the air, the clothing, the drink, or the medicines taken during sweating; for such assistance is seldom necessary, and it cannot always be employed with safety. For sweats forced by heat are seldom attended with good effects, and in many diseases heat is highly injurious.

1503. It is also necessary to guard against cold, not only during the time of sweating, but after it is finished; because, for a very obvious reason, it is unusually dangerous, as many have felt to their cost, who had thought themselves cured by an excellent sweat.

CHAP. XXXVIII.

Of errhine, sialagogue, and expectorant remedies.

1504. AMONG evacuants, those remedies are usually classed which promote the secretion and excretion of the fluids of the nostrils, of the mouth, and of the lungs; all of which have this in common, that being destined to a definite use within the body, and, in healthy persons, being secreted in no greater quantity than is requisite for their peculiar purposes, in that state they ought never to be ejected: during diseases, however, they are frequently deficient, superabundant, or vitiated, and, at the same time, when it might be of the utmost importance that the excretion should be free, it is effected with difficulty. For the correction of such disorders, then, there is sometimes occasion for remedies, which, like other evacuants, may likewise serve other purposes (1341, &c.).

1505. Errhines, or apophlegmatizonta, is the denomination given to those remedies which promote a discharge of mucus or other humours from the nostrils. Of these, the greater part, if not the whole, excite sneezing, at least in persons unaccustomed to them; and when administered with this intention, are called ptarmica, or sternutatories.

1506. It is alleged that various emollient remedies applied to the nostrils produce such a discharge; but it is much more frequent and efficient to apply to them proper stimulants, sometimes milder, sometimes more acrid, as circumstances may require. They may also be inserted or received into the nostrils in various forms, as diluted with water, reduced to powders, or solid and entire, or even drawn in with the breath, in the form of vapour.

1507. Sugar, a variety of salts, many acrid plants, such as asarum, betony, lavender, marjoram, pennyroyal, rue, tobacco, black hellebore, euphorbium, &c. are by medical writers enumerated among errhines. But the two last mentioned of these, are, on account of their extreme acrimony, rarely employed, and, in fact, ought not to be rashly administered; and of all medicines of this kind, tobacco is most frequently used, as a luxury indeed rather than as a remedy.

1508. Their effects will be very easily understood, from what has been already said concerning evacuants in general. The evacuation indeed which is produced by them, is too trifling for having any effect on the general mass of fluids, and the system in general; but it may considerably affect the parts contiguous and connected.

1509. Errhines, then, in the first place, excite the nostrils, afterwards the whole body, by means of that general sympathy which has been already frequently mentioned; they produce a greater secretion and discharge of their mucus, and of other fluids which are ejected with it, such as the tears; they somewhat alter the distribution of the blood, by producing a greater determination of it to the nostrils, and therefore less to the contiguous parts; and by exciting sneezing, shake, and almost convulse the whole body.

1510. Hence they are sometimes useful, especially to persons accustomed to them, in defect of the mucus of the nostrils,—or it's too great spissitude, whereby the sense of smell is extinguished or depraved, and possibly other disorders of still greater moment are induced, as diseases of the eyes, or whole head; they are useful also in torpor, whether topical or general, in lethargy, in palsy, in deafness, amaurosis, and ophthalmia of various kinds, both dry and moist; in headach, and, as is alleged, certain diseases of the nostrils. We are also told, that they have sometimes good effects in other diseases, even of parts more remote, as catarrh, phthisis, inflammation of the lungs, &c. But the use of them in these is not so well ascertained. It is farther alleged, that the sneezing excited by proper remedies, has sometimes had a good effect in certain diseases of the nervous system, viz. convulsions, torpor, palsy, &c. That great and sudden agitation, and almost universal convulsion of the body, by breaking through a depraved habit (386.), and perhaps by overcoming that irritation on which other convulsions depend, may prove in some degree a remedy for these, and revive sense and motion in parts previously torpid and paralytic; as is manifest from the occasional starting of paralytic limbs, when the patient is sneezing.

1511. But errhines unseasonably employed, do no little injury, by producing an evacuation and determination of blood towards the head—altogether preternatural: they also render the smelling obtuse, sometimes injure the sight, and frequently weaken the stomach. This, for the greatest part at least, is evidently imputable to the narcotic quality of the medicine commonly used. But, however absurd and pernicious the first use of errhines is to persons in good health, it is often necessary to yield to such a habit, when it has been established for some time (1351.).

1512. In fine, for another reason not at all obscure, sternutatories are frequently dangerous, in plethora, in the case of a congestion in the head or lungs, in recent and violent inflammation of the eyes, and in ruptured patients; nor in fact ought they to be incautiously ordered to those who are afflicted with hysteria or epilepsy (1510.).

1513. Those remedies which excite saliva, are called sialagogues.

1514. But this may be effected in various ways, for the saliva flows more copiously than usual when the mouth is washed and fomented with proper emollient gargles; it flows also in great quantity during mastication, because the action of the muscles and the motions of the jaws and tongue completely squeeze and emulge the glands which secrete it and the passages by which it is conveyed into the mouth, though the matter itself which is chewed be of the mildest description: but gargles and masticatories somewhat stimulant and acrid, have a much greater effect in exciting saliva by their chemical stimulus. Hence the action of many salts, of wax, of mastich, of myrrh, of spices, of tobacco and it's smoke, &c. in exciting saliva, will be easily understood.

1515. Certain affections of the mind, and some very sharp sounds, very grating to the ear, often produce a great flow of saliva; but these have no concern with medical practice.

1516. Nausea and vomiting, by whatever means they are produced, also nauseous tastes, excite saliva; hence all emetics are conducive to that purpose. But such use of those medicines has been already considered in the proper place (1388.).

1517. But of all remedies mercury has the greatest and most certain effect in exciting a discharge of saliva, and in fact seems to be the only one that possesses a specific power of this kind, by whatever channel it be received into the body; provided the dose be sufficiently large, and that it has been rendered active by suitable preparation. For this most efficacious remedy somehow receives it's salutary powers by art: for while it is fluid and unmixed, it seems to be naturally inactive, and has been often taken in great quantity without inconvenience, and indeed without any effect. But being triturated with oily or mucilaginous substances, or being by fire, or by proper acid or alkaline matters reduced into the form of a salt, an oxide, or a gas, it acquires remarkable and almost incredible powers; so that the smallest quantity of it being received into the body, produces in one case the most salutary effects, in another the greatest mischief. For some centuries past physicians and chemists have been busily occupied in devising preparations of this remedy, which they have brought forward in countless numbers; the powers of all these are not precisely the same, and, on the other hand, the diversity is not great; and each has it's own commendations, at least it's advocates. This, however, is not the place for treating of their minute differences and the various purposes to which they are adapted. It will suffice to mention, that, though all excite saliva, some affect the mouth more slowly than others; and it's salts and oxides have more effect in promoting perspiration (1469.), than those medicines prepared from it by trituration with lard or honey, and which in general more readily excite the salivary discharge.

1518. But various sialagogues produce effects in general similar to those of other evacuants. They excite the mouth, the tongue, the contiguous parts, and, in some degree, the whole body, by means of their stimulating quality, and partly by this, and partly by the evacuation which they effect, they promote the circulation in those parts; they remove impediments or obstructions which resist the natural secretion of the fluids of the mouth; they alter in some degree the distribution of the blood, by a greater determination of it to the mouth; a moderate discharge of saliva has some effect in emptying the contiguous parts, but, when more copious and long continued, it proves a general evacuant.

1519. Hence sialagogues, especially such as are applied to the mouth itself, and masticated in it, sometimes prove beneficial in defect or spissitude of the fluids of the mouth; in torpor and palsy, especially of the tongue; but they are not to be neglected, particularly in the case of those accustomed to them, in general palsy, and in a predisposition to apoplexy or lethargy; sometimes also in inflammation or congestion of blood; or in certain irritations of various parts of the mouth, fauces, throat, and head, as toothach, headach, water in the head, ringing of the ears, vertigo, deafness, ophthalmia, blindness, catarrh, quinsy, &c. They are believed to have been often useful in guarding against the contagion of the plague and other fevers, which many suppose to be received into the mouth and to be swallowed along with the saliva; nor are there wanting some, especially among those who are fond of tobacco, who contend that the constant use of them is in no small degree beneficial to many persons both of a torpid and also of a very phlegmatic habit.

1520. They are hurtful, however, to all who are in health, and still more so to those whose stomach is weak, for saliva greatly assists the digestion of food.

1521. It is scarcely necessary to discuss the subject of a salivation induced by mercury, with a view to the cure of lues venerea; for it is fully admitted among medical men that such evacuation is never beneficial in that disease,—that it never fails to be hurtful,—and that whatever be the action of the remedy, those patients generally obtain the best and most effectual cure to whom the mercury is administered in such a way as not to produce either this or any other manifest evacuation. But such a vast flow of saliva as was usually effected by a great exertion of skill, and to be continued long with horrible torture to the patients, is in many ways extremely injurious to the body. It is not, however, unprofitable, to give mercury in such manner that it may affect the mouth a little, for by this means the practitioner will be apprised that the remedy has pervaded the system; he will also for the most part be able to judge with certainty, that as much has been already taken as can be productive of benefit, until the mouth return to a sounder state. It is truly a matter of the deepest regret that some have such a constitution of body that the smallest portion of this medicine, such as is utterly inadequate to the cure of that disease, excites saliva in them in the most copious manner, perhaps with severe inflammation of the mouth; that others again bear a vast quantity of the same medicine for some time with the mouth entirely unaffected, and the disease not at all cured, till at length all at once it rush with violence to the mouth, and there produce the most distressing effects. That man will truly gain universal applause who shall discover such a preparation of mercury as shall completely eradicate lues venerea, and at the same time neither excite saliva nor hurt the mouth, the stomach, or intestines. But, in the meantime, that preparation and that administration are to be accounted the best, which do the least injury to those parts, while they carry off the disease.

1522. Expectorants is the name given to those remedies which promote a spitting or expectoration from the lungs and trachea.

1523. There is in fact frequent occasion for such remedies, seeing those parts are so frequently either irritated by a thin and acrid mucus, almost overwhelmed with it's quantity, or, in short, oppressed by it's excessive density and tenacity, rendering it very difficult to be ejected by coughing (600, &c.). Besides, other matters, such as blood, pus, water, &c. being accumulated or effused in the lungs, must be expectorated in the same way as too copious or morbid mucus; and some diseases are completely cured by such expectoration.

1524. It is not surprising, then, that physicians, in search of such remedies, administered many medicines with this intention. But all which they are pleased to call expectorants possess either very small, or what is worse, very uncertain qualities of this kind. For it is not yet agreed whether any medicines possess a specific power of promoting the secretion or expectoration of mucus from the lungs; and general stimulants received into the body have usually no great effect on the lungs; those medicines too, which may be inhaled with the breath in the form of vapours, are neither of great benefit, nor, for reasons sufficiently manifest, at all adapted to common use.

1525. Among the ample farrago of medicines which are by various authors termed expectorants, two classes are most remarkable, namely, stimulants or attenuants, and emollients, or, as they are promiscuously called, demulcents or incrassants.

1526. In general the most powerful of the stimulants are squill, gum ammoniac, assafoetida, and perhaps tobacco, either chewed or smoked; but many other medicines of inferior importance, as arum, ground ivy, hedge mustard, Iris Florentina, &c. are usually enumerated along with these. There is some debate among medical men concerning the action of this class of medicines; for some believe that whatever benefit is derived from them is wholly to be attributed to the nausea (1529.) or perhaps the vomiting which they excite; while they are fully of opinion that some degree of stimulus being derived from them, and conveyed to the lungs with the blood, irritates the parts which secrete the mucus, and consequently renders it thinner and more copious. Expectorants of this class produce their best effects when the mucus of the lungs is too thick and tenacious.

1527. To the other class (1525.) belong mild, oleaginous, gummy, and mucilaginous medicines; such are oil of olives, and of almonds, spermaceti, gum Arabic, tragacanth, sugar, linseed, althaea, liquorice, tussilago, and the like. But the oleaginous parts of these, being oppressive to the stomach, they are generally improper, and the gummy or mucilaginous medicines are commonly preferred to them. This class is most useful when the mucus is too thin and acrid, and there is a very frequent and almost dry cough, with great irritation of the lungs and branches of the bronchia. There is some dispute also about the action of medicines of this kind; some supposing that they produce their good effects by being received into the blood and conveyed to the lungs, while others suppose that it is only during deglutition, namely, by besmearing the fauces and glottis, and by this means defending them from certain irritations. And this at least is certain, that many of them so suddenly allay the cough, and remove the irritation previously very troublesome, that it is utterly incredible that even the minutest particle of them could have reached the affected parts by the blood; but the cough being allayed, and the agitation of the lungs consequent upon it being for a while composed, the mucus which was present in the lungs and trachea, though formerly too thin, and perhaps acrid, by the delay becomes inspissated and mild; and the strength of the patient being in the mean time somewhat restored, it is easily and copiously ejected with the first slight cough that occurs. Besides, that morbid tenuity and acrimony of the mucus, though it seems to take place sometimes, is neither so certain, nor so frequent a disorder, nor of so great importance as many practitioners have supposed; for the greater part of the symptoms and uneasiness which were thought to proceed from it, may with greater probability be imputed—partly to such deficiency of that mucus as usually happens during inflammation of the mucous membrane,—partly, also, to that keener feeling and increased impatience of any stimulus which belongs to all parts that are in a state of inflammation;—and partly to the very severe irritation of frequent coughing, which shakes the whole lungs, irritates the trachea, especially the glottis, and deprives them of their mucus. So great is the force and noxious effect of all these, that the air itself, though very mild, proves at last a stimulus, nor can a breath be drawn indeed without severe irritation, pain, and most frequent coughing.

1528. Natural sleep interrupts the expectoration for some time, but afterwards promotes it most effectually. Opium likewise operates in the same manner when administered with the same intention, which is frequently the case now, with remarkable benefit to the sick.

1529. All emetics, whether they produce complete vomiting, or only nausea, decidedly promote expectoration from the lungs and trachea. This is not to be attributed solely to the agitation of vomiting, though that may no doubt occasionally have some influence; perhaps the stimulus of the medicine, suppose squills, reaches the lungs, and thus gives it's aid; and, in short, the nausea, by means of that singular consent between the stomach and many other parts,—may either relax the spasm, if any exist, of the very minute secreting and exhaling vessels of the lungs,—or excite them, as many suppose to be the case in the extreme vessels of the skin, to more vigorous action, whence the mucus becomes at once more copious and healthy, and it's expectoration more easy.

1530. In general the same may be affirmed of sweat, whether spontaneous or excited by proper remedies; which on some occasions indeed becomes no contemptible expectorant remedy. Under this head perhaps we ought to take notice also of that benefit, not a slight one truly, which is obtained from proper exercise, particularly riding on horseback, when there is occasion for much expectoration from the lungs.

1531. The steam of warm water inhaled into the lungs, foments and moistens, softens and relaxes them, relaxes the spasm if any be present, promotes the exhalation and secretion of mucus, which it also dilutes and attenuates, thus rendering the expectoration of it more prompt and easy, and becomes an excellent expectorant remedy. More acrid vapours, as those of vinegar and smoke of tobacco are sometimes employed, and may agree pretty well with some patients, but to many unaccustomed to them, they are almost insupportable.

1532. In fine, epispastic remedies, blisters for instance, applied to the breast, side or back, not seldom manifestly promote expectoration. These also, as will be more fully explained afterward (Chap. XLI.), by means of that singular sympathy that subsists between the external and internal parts, affect the latter in various ways, relaxing spasm, carrying off inflammation, and of course restoring a more equal distribution of the blood, if for some time previous it had been irregular. Their expectorant powers are apparently to be ascribed to these modes of operation, rather than to any stimulus which they communicate to the lungs.

CHAP. XXXIX.

Of emmenagogues.

1533. Those remedies which excite the menses are by medical men called Emmenagogues, or Menagogues.

1534. That discharge, natural and necessary, at least salutary to the female sex during a great part of their life, sometimes does not appear at the age of puberty; and, after women have had it regularly recurring for a shorter or longer period, it frequently becomes defective or quite suppressed, though they be neither pregnant nor giving suck. Hence proceed numerous and severe diseases, not unfrequently undermining the health almost universally; as has been already explained in it's proper place (Chap. XXI.).

1535. While nature itself shews by almost daily instances, that innumerable diseases proceeding from such defect of the menses, and incurable by other means, are relieved or carried off by their flowing anew, practitioners strain every nerve to solicit the flux by artificial means; and particularly administer many medicines which are supposed to possess a specific quality of that description.

1536. But though numerous medicines of very different kinds, have, by various authors of no mean reputation, both formerly and of late, been wonderfully extolled as excellent, and even infallible means of provoking the menses, it is not fully ascertained whether any medicine possesses such a specific power; not that there is any doubt that many medicines have frequently effected that purpose, but because they appear to have produced that salutary effect by a different and more general mode of operation; and seem neither to affect or irritate the uterus in any specific manner, nor to excite the menses by any singular property, as mercury, squill, or aloe, respectively excite the saliva, urine, or stools. In the meantime, it is sufficiently certain, that the greater part of the medicines which the good women, and even many practitioners, diligently administer for eliciting the menstrual discharge, are either utterly inefficient, or at least very ill adapted to that end.

1537. It must not however be denied, that certain medicines, which shew no other powers, and affect no other parts, have sometimes appeared to affect the uterus in a considerable degree, and to excite the menses very powerfully. For a celebrated author, worthy of all credit, affirms that he has discovered such a virtue in madder, a plant of no great name in medical practice; the root of which appeared to have been of surprising advantage, and to have exceeded all expectation in provoking the menses, in numerous cases, both recent and of long continuance, proceeding from various causes, attended with very different symptoms, and which had not yielded in the least to other remedies previously administered. It is very difficult to explain by what means such a plant, of no force or stimulus in any other respect, can irritate, or in any way affect the uterus and expel the blood with such uncommon effect: but more extensive experience may shew this. In the meantime, it is perhaps a matter of regret rather than of astonishment, that a remedy so mild and safe, which even the most delicate females could easily bear, and equally adapted to all cases of the disease, should not always be employed with equal success; and that in many patients indeed it has been tried in vain.

1538. As for other medicines which are usually given as emmenagogues, which possess other qualities more general and manifest, by which they seem to bring relief in suppression of the menses, though not only differing, but quite opposite (807.) in nature, their action and administration will be easily understood,—if we reflect how various (815, 16.) are the causes of suppression or retention of the menses, and how many and how different are the morbid affections which in various cases proceed from their deficiency. For whatever removes the cause will be in some measure a remedy to the complaint; besides, whatever alleviates or carries off the disorders consequent on amenorrhoea, or counteracts only a part of them, frequently restores the discharge; namely, by rendering the body, through the relief already obtained, more adequate to the future exercise of it's usual functions. For as the regular flow of the menses is exceedingly conducive to good health, so good health is no less conducive to the regularity of that discharge.

1539. The most frequent general causes of amenorrhoea are two; namely, either a deficiency of the force requisite to propel the blood through the vessels and pores of the uterus, while no unusual obstacle is in the way; or some preternatural resistance or impediment which cannot be overcome, either by the usual propelling powers, or even by the much stronger powers excited by nature or art. Very frequently indeed either both causes concur from the beginning of the case, or if it has originated in the one, particularly the latter, yet amenorrhoea not unfrequently produces the latter also, whence the disease is more severe, continues longer, and is more difficult of cure.

1540. When through a bad conformation of the uterus or vagina, derived either from nature or disease, the blood cannot be discharged into the cavity of the former, or cannot escape by the latter, some very rare instances of which are related by respectable authors, it is evident that such obstruction can be removed only by a surgical operation, or the disease must be utterly incurable; and, at any rate, all emmenagogues would be administered to no purpose.

1541. But the usual causes of amenorrhoea are often obstructions of a much slighter description, and more easily removed: such are—a constriction of the uterine vessels and pores, or spasm induced by cold, some depressing affection of the mind, fever, &c.;—general weakness of the body, particularly the circulation too languid; when, by means of irregular determinations of the blood to other parts, it is sent to the uterus in an insufficient quantity, and without due force; when, by the continuance of the disease, the uterine vessels and pores have gradually become contracted and almost impervious; or, in short, when the blood, finding no exit by the proper channel, disturbance is excited over the whole system,—particularly in morbid distribution and increased impetus of the blood, pains of the loins, the belly, and the head, hysterical convulsions, &c. and, at last, in the obstruction or injury of all the functions of the body. In such cases, there is evidently room for various kinds of remedies; such as emollients, debilitants, stimulants, sedatives, anodynes, antispasmodics, and all the evacuants.

1542. It must ever be kept in mind, that in amenorrhoea, whether in cases of retention, or of suppression, remedies are not always necessary for bringing on or restoring the discharge, especially if the health be in other respects good. For in such a state, nature herself usually brings on the discharge, if a case of retention, in her own time, which art cannot easily anticipate,—and restores it when it has been for some time suppressed. And indeed there appears to be no other way of accounting for the powers which some have been pleased to ascribe to certain old women's remedies, which have really no effect in exciting this discharge; but when they have been administered for a considerable time, and the body meanwhile discharging it's other functions indifferently well, the menses commonly return again; and thus the praises due solely to nature and time, are easily lavished on perhaps a very inefficient useless medicine. Hence we may also conclude, that whatever remedies are employed as emmenagogues, a proper regimen as to diet and mode of living must never be neglected; it being so very eminently conducive to the general health of the body, which is often injured in a variety of ways.

1543. As to the several remedies usually given as emmenagogues, although the action and use of every one is pretty well understood, they are nevertheless scarcely reducible into neat and accurate order ; for this reason, that many of them of the greatest efficacy, operate not merely in one, but in a variety of ways, often producing at the same time different necessary, or at least salutary effects, and of course are to be administered equally with different intentions, and in varied cases.

1544. Thus, whether amenorrhoea proceed from deficiency of the propelling powers, or from unusual obstruction or resistance difficult to overcome, or whether there be a concurrence of both causes, and the general health be shaken,—proper exercise of body, which far excels all other remedies of this class, and is best adapted to the diversity of cases, may prove very useful ; by thoroughly exciting the body, relaxing spasm, if any happen to be present, giving facility and intensity to the circulation, removing irregular and morbid determinations of the blood, and effecting an equal and natural distribution of it through the whole system ; at one and the same time recruiting the strength, and aiding and promoting all the functions of the body, injured and become languid by disease.

1545. After the above, the next place among emmenagogues is perhaps due to the electric fluid, which, by shocks (1201.) applied even to the whole body, but still more promptly and decisively about the loins, the belly, and the pubes, so powerfully excites the discharge, that it frequently comes on unawares in the very moment when the shock is administered, and is entirely imputable to it's stimulus.

1546. Also the elevating affections of mind, the stimulus of which is often found so great and salutary (1210), have frequently no inconsiderable effect in restoring the menses, just as affections of the opposite character often check them.

1547. A great number of stimulants are also frequently given as emmenagogues, and not seldom produce manifest good effects ; also the greater and best part of the medicines to which a specific quality of that kind is usually imputed, are nothing else than general stimulants; nor is it difficult to explain how such medicines, by stimulating the system, particularly by promoting the circulation, frequently cure the suppression, to what cause soever of those already explained (1939.) it may be owing. But of these the warm or fetid gums, castor, and the like, are generally the best and most efficacious; yet there are some who greatly commend various acrid plants, with the essential oils, and other preparations from them,—such as rue, savine, pennyroyal, black hellebore, and a great many others of inferior and more uncertain powers,—such as snake-root, saffron, horehound, matricaria, &c. We have indeed received a very ample and astonishing testimony to the powers of black hellebore, in exciting the menses, from a man of the greatest experience and celebrity, who has long since attained the highest honours in the medical profession. This celebrated author has not hesitated to affirm, in the most positive manner, that the plant in question possesses such efficacy, that he scarcely remembers that it ever disappointed his expectation when given for the above purpose: and, besides, that he had observed, that in every instance in which a mal-conformation of parts, or any other cause whatsoever, had prevented the desired effect, then the blood had been propelled by other channels; whence he concluded, that his favourite remedy possesses an eminent and altogether singular power of propelling the blood. But the the good old man was surely dreaming, otherwise he would never have given so great a commendation to such a medicine in such a disease, no less unworthy of the honour of a gentleman, and the caution of a judicious practitioner, than inconsistent with almost daily experience. For though the plant so highly extolled may prove in some cases an excellent remedy, and sometimes perhaps propel the blood by other channels, when denied it's natural passage by the uterus, which may probably be effected by every more acrid stimulant; this is so far from being it's uniform or certain effect, that it has not proved a remedy to every tenth patient who has taken it, nor produced other morbid discharges of blood to one of a thousand.

1548. Mercury must also be referred to the stimulant emmenagogues, as it's efficacy and use in this disease seems to be of that character alone. Formerly, indeed, many medical men were persuaded that the menses were frequently suppressed by means of a morbid lentor or spissitude of the blood, and that mercury possessed a great efficacy in dissolving and attenuating it: now, indeed, both these opinions are equally obsolete, but it is sometimes no inefficient remedy, especially when the disease has been of long continuance.

1549. Next after these come certain remedies which sometimes seem to bring on or restore the menses by some mixed and ambiguous power, at once corroborant and stimulant, such as seems to exist in many bitter plants (1099, 1196.). To this head might also be referred several of the medicines already mentioned (1547.). Some indeed would class all the bitters with emmenagogues; but their powers are found to be neither great nor certain.

1550. Iron prepared in different ways, and medicinal waters impregnated with iron, the powers of which are certainly considerable, are frequently of singular advantage as emmenagogues. But those who attend watering places with this intention, have usually other aids at the same time, and perhaps of no less importance.

1551. But among corroborants, the cold bath is by far the best and most effectual emmenagogue, perhaps not more by it's corroborant powers, than by the very salutary stimulus which it communicates to the system. It must also be recollected, that these, and the like stimulant and corroborant remedies, not only increase the impetus of the blood, but over and above, by removing irregular distributions of it, effect that which is equal and natural, and not unfrequently relax and prevent that spasm which at first view they might seem apt to induce.

1552. Physicians have in various ways endeavoured to administer stimulants so as to affect the uterus as much as possible. With this intention they have sometimes applied plaisters of warm gums, &c. to the abdomen, and parts contiguous: but such practice is now nearly or altogether laid aside. Of the administration of electric shocks or sparks to the region of the uterus, we have already spoken (1545.).

1553. The smarter cathartics, especially those of more difficult solution, which carry their acrimony down to the lowest part of the intestinal canal, not only affect that, but by means of the proximity of the parts, and combination of vessels, greatly irritate the uterus, and are frequently very efficacious in bringing on the menstrual flux; and no medicine is given with this intention more frequently or successfully than aloe. This indeed, and all medicines of this class, are so efficacious as emmenagogues, that they often bring on the discharge unseasonably, during pregnancy for instance, whence violent flooding, abortion, or perhaps the risk of life. More acrid clysters also for the same reason sometimes excite the menses.

1554. Some have judged it expedient to order the more acrid diuretics with the same intention, especially cantharides, and it is probable enough, that a medicine which irritates the bladder so violently, and produces so great a determination of the blood toward it, will also affect the uterus in some degree, and perhaps excite the menses: but as yet we have not had sufficient experience of such a use of diuretics.

1555. In short, some have not hesitated to introduce stimulants in the form of pessaries into the vagina, or to inject them in a fluid form into the uterus itself. But such a practice is by no means adapted to common use, being of so revolting a character, that a woman of delicacy can scarcely be expected to adopt it. Besides, it's effects are uncertain, and it's powers ambiguous: for as the uterus is naturally a very delicate organ, much disposed to obstruction, or even to schirrus, we must not rashly tamper with it.

1556. To this head must nevertheless be referred a remedy quite safe, natural, and in many cases very efficacious; namely, the lawful use of venery. The power of this remedy in bringing on the menstrual discharge is unequivocally attested by the numerous instances of young women, who, in their virgin state, were pale, thin, and unhealthy, speedily transformed by a happy wedlock into rosy, sleek, and vigorous wives.

1557. There are likewise many antispasmodic remedies frequently given as emmenagogues, and not seldom with singularly good effects. These are not only of the stimulant (1183.), or foetid (1547.) description, the powers of which are ambiguous, but decidedly sedative, and even narcotic, as opium, hemlock, and henbane. —With respect to the two last mentioned, it is not indeed agreed whether they possess the powers which some have been pleased to ascribe to them; but it is not to be doubted, that they may sometimes have beneficial effects, in the same way as opium, though they can scarcely exceed it. But opium in many cases most powerfully excites the discharge, and is frequently to be preferred to all other medicines; particularly when nature makes her usual efforts, and the blood is not only circulating more quickly than usual, but more copiously determined to the uterus,—though it cannot be discharged by reason of the excessive constriction or spasm of the uterine vessels. Such a condition of the system may also be distinguished by symptoms for the most part unequivocal: in the first place, by a frequent and strong pulse, increased heat of the skin, severe pains of the loins and uterus, nausea, vomiting, and other symptoms of a disordered stomach, pain and a sense of weight in the head, and all the symptoms of blood repelled from the uterus, and of course determined to other parts. In this state, opium, even taken by the mouth, relieves the spasm, and relaxes the uterine vessels, and thus frequently procures the discharge by that channel, but is generally found much more efficacious when given by way of clyster; the reason of which is by no means obscure.

1558. In similar cases, with nearly the same intention, and frequently with no small success, certain emollients, debilitants, and particularly evacuants, are ordered. Blood-letting is also useful in many cases, in some absolutely necessary, especially when recent, for in a case of long standing it's aid is more seldom requisite. It is not indeed to be expected that this evacuation, though perhaps quadruple of that natural one which had failed, should with equal expedition and efficacy, remove the disorders arising from the defect of the latter. Yet, when there is much fever, irritation, severe pains, full, frequent, and strong pulse, it is generally of use; and not only relieves those morbid symptoms, and in some degree counteracts whatever injurious effects attend the absence of the menses, but not unfrequently restores them in a short time by relaxing all the vessels.

1559. Vomiting also frequently restores the discharge after it has been suppressed for some time, partly perhaps by means of the stimulus of the medicine employed; partly by the agitation and violent efforts at vomiting, which shake and excite the whole system, especially the abdomen, compress thoroughly it's viscera, remove many of their obstructions, and facilitate the circulation through them;—partly by taking off the spasm, and relaxing the vessels over all the body, so that the free and natural distribution of the blood is restored. But in whatever way it's operation is accounted for, this much is certain, that the menses often return to females after long suppression within a few hours after vomiting; and in some cases appear suddenly during the operation of the emetic.

1560. Purgatives also are sometimes conducive to the same end, not only by the stimulus, whether general or specific (1553.), of the particular medicine employed, but by relaxing the body and all the vessels, particularly those in the abdomen, removing obstructions and morbid congestions of blood in it, and giving complete facility to the circulation through it's viscera and the neighbouring parts. Hence, when it is effected by the use of the milder purgatives, and what are called refrigerants, it is sometimes useful, nearly in the same cases as blood-letting, and in a manner not very dissimilar.

1561. Many remedies, especially emollients, which invite the blood downward, lead it back, compel or give it a determination to the uterus, are frequently of great use in bringing on the discharge. For this purpose frequent and diligent friction of the legs and thighs, and heat applied in different ways to these parts, and particularly the warm bath, fomentations, clysters, and steam of warm water, are often applied to the lower extremities, to the external parts themselves, or those contiguous; and, for a reason sufficiently evident, are not unfrequently of great advantage. It is also of use in all cases of amenorrhoea always to keep the feet and legs warm, or at least assiduously to defend them from cold and moisture; there being no more frequent cause of amenorrhoea than cold applied to the lower extremities.

1562. Lastly, singular benefit has sometimes been obtained from the application of a proper ligature, tightened at pleasure by a screw, which may compress the arteries of the thighs in such a manner that the blood, passing that way with difficulty, and determined to the vessels of the uterus in greater quantity and with increased force, may open these and make it's way through them. This species of aid, which is evidently attended with it's own inconveniences, frequently forces on the discharge in the very speediest manner, especially when assisted by certain emollient and relaxing remedies already enumerated (1561.).

1563. Seeing the various remedies which are prescribed for soliciting the menses are so different and even opposite, it is incumbent on the practitioner to guard diligently against administering any of them unseasonably. It would certainly be absurd, and in many cases attended with the worst effects, to give the more powerful stimulants to patients perhaps already feverish, agonized with pain, and in various ways excessively irritated; and it were nearly an equal impropriety to give weakening, sedative, and evacuant remedies to those who are worn out and exhausted already with tedious illness, and long since excessively relaxed. The regimen of the diet and mode of living must be varied according to the different causes and periods of the disease, and states of the body. The cases are indeed rare in which exercise long continued does not succeed.

1564. In the use of these, as well as of other evacuants, and for the same reasons, caution must be used that at any rate the more powerful and acrid be not administered to those who are very weak or of great mobility.

1565. It is above all things necessary to guard against inadvertently giving them to pregnant women, a blunder not unfrequently committed by a temerity common enough, but not at all creditable. Even the decent matron is sometimes deceived in this matter, and of course leads her medical attendant into a shameful and dangerous mistake. But, for reasons sufficiently manifest, one should never hastily give credit to unmarried women complaining of amenorrhoea, at least to those of the lower class.

1566. In soliciting the discharge by medicine, it must be always kept in mind that nature is much more powerful than art; that while the former is in opposition, or lending no assistance, the latter can have little effect; and therefore the most part of the remedies now enumerated, equally stimulants, anodynes, relaxants, &c. are chiefly, perhaps only, to be administered when nature makes an effort to produce the discharge; for by the power of habit, even in suppression of long duration, such efforts are repeated, and in many cases at equal and monthly intervals. For the most ample experience has proved that when no such efforts take place, all the best remedies are not only in general given in vain; but after they have been long employed in this improper manner, they have less efficacy, even at the very time when, with the assistance of nature's efforts, they would have had the best effects, if their powers had not been previously thrown away, and consumed by an injudicious administration. This, however, does not hold equally true of them all, and especially of mercury and exercise, which are only or chiefly to be used during the intervals.

CHAP. XL.

Of blood-letting.

1567. NEXT after the various evacuations excited by the natural channels, are to be considered those also which are affected by new and artificial ones. Of these blood-letting is evidently the principal, a choice remedy, than which there is not a more powerful or present aid in various and even very severe diseases; nor in fact are the diseases few in which it frequently appears to be the only hope and resource. But it is often an ambiguous and dangerous remedy, and in general there is no evacuation which requires to be managed with greater prudence and circumspection; or which, being unseasonably effected, does more extensive injury, or does it with greater certainty and expedition.

1568. Blood is abstracted in different diseases in various ways, either by opening a large vein, sometimes perhaps an artery, with an orifice so wide as to admit a great quantity of blood to flow out by it in a short time; by leeches applied to the skin, which suck it more slowly and sparingly; by cupping-glasses placed over the skin, which has been previously cut and scarified, to encourage the discharge of blood, which otherwise would scarcely flow by many minute wounds; or by scarifying well some parts to which neither cupping-glasses nor leeches can be applied.

1569. The mode first mentioned (1568.), by effecting generally a great, at any rate a sudden evacuation, although perhaps it immediately and chiefly exhausts the parts whence the blood is drawn, affects nevertheless the whole system in a short time; and, on account of this sudden and general effect, is by medical men not improperly termed general bleeding.

1570. The other modes (1568.) of abstracting blood are, for distinction's sake, called partial or topical bleeding. For the evacuation effected by this means is generally small, always slow, and has little effect on remote parts or on the body in general; because, to a certain extent, the vessels readily adapt themselves to the quantity of fluids which they contain, while the alteration takes place slowly (523.); but it often operates with singular effect on the part whence the blood is drawn, and even on those contiguous to it; and not unfrequently is much more efficacious in various topical disorders than a general bleeding, though perhaps extending to ten times the quantity: and what is nearly of equal moment, it is often safely employed, and may therefore be several times repeated, when a general bleeding would evidently be entirely out of the question on account of the body being already exceedingly exhausted and weakened.

1571. The effects of blood taken in moderate quantity from the veins are commonly the following: it diminishes the quantity of the circulating fluids, therefore it relaxes the containing vessels, thus it abates their powers (321, 23.), and of consequence moderates and represses the impetus of the blood, which in a great measure depends on their contraction (424, 5.), renders the pulse softer and slower, abates the force of the muscles, in short, it both cools, and, in some degree, relaxes the whole body.

1572. But if in some instances after blood-letting the pulse become more full, strong, and frequent, and the impetus of the blood be evidently increased, the system appear braced, and it's strength recruited and facilitated, this shews no doubt that such a load and mass of blood (324, 514.) as was removed by the evacuation, produced over distension in the arteries, overwhelmed their powers, and oppressed the whole body.

1573. But the natural and common effects of this evacuation (1568.) are sufficiently manifest, both in the healthy and in the greater part of the sick, either during the operation or soon after: for the blood, on the first opening of the vein springing forth with great force, as if in a state of ebullition, by little and little flows in a more languid stream; and by and by stagnating it cannot easily be compelled to flow, either by the friction of the arm, or by the contraction of it's muscles (427.); and through the failure of the propelling power, not unfrequently stops entirely before the requisite quantity has been obtained. Frequently too, in a very short time after letting blood, it's impetus seems to be exceedingly abated, although no change was to be observed while it was flowing. Nor indeed is it a rare thing for certain diseases, proceeding from excessive impetus of the blood, to be speedily and completely carried off by one moderate bleeding, without the aid of any other remedy; and, in a manner nearly analogous, many discharges of blood in some degree bring their remedy with them.

1574. Copious bleedings, however, are attended with more serious and commonly more pernicious effects. For the arteries and different cavities of the heart, being greatly and suddenly relaxed, and thus their powers diminished, the impetus of the blood becomes so defective, that it is no longer adequate to the exciting and adapting of the brain to it's functions; whence arise vertigo, nausea, vomiting, and syncope, and not only the interruption of the action of the heart and arteries, but of all motion and sense. Those who have been brought into this state by great loss of blood, though the syncope should be of short duration, and easily removed, often recover their former strength slowly and with difficulty; and sometimes their convalescence is scarcely ever complete, especially if they have been previously exhausted and weakened by disease. Farther, by reason of this general weakness, and especially the languid state of the circulation, many of the functions are not a little impeded; and particularly that vis conservatrix is surprisingly impaired, by which it usually wards off many diseases, or resists those that are already present. In fine, the condition and temperament of the blood itself is considerably affected by such evacuation, frequently becoming afterward more thin and pale, the thinner parts of it being quickly recruited, the grosser more slowly (524.). But there is in this matter an incredible difference between different persons (1360.), so that while some lose several pounds of blood easily and without inconvenience, others faint or at least are greatly enfeebled by the loss of a few ounces. Habit also has a great influence even in these matters, for persons accustomed to it support with ease such an evacuation as would prove not a little injurious to those unaccustomed to it though evidently stronger. Nor, in fact, does such a difference subsist only between different persons, but to a certain extent between whole nations. For example, neither could the French medical practice be safely applied to Englishmen, nor ought the English practice to be always prescribed for the French; to whom, from the depraved and inveterate habit of letting blood in almost every disease, that evacuation is frequently both supportable and evidently requisite, when it would be of no use at all, or very pernicious to persons less accustomed to the practice, though labouring under similar diseases.

1575. But the sudden loss of a great quantity of blood is quickly and extensively injurious to all, and is not unfrequently attended with death. For it induces not only great debility, vertigo, nausea, or vomiting, and syncope (1574.), but general convulsions too, which for the most part prove fatal.

1576. In fine, frequent blood-letting is attended with it's inconveniences and dangers, and seldom fails to do hurt, weakening and relaxing the system, injuring many of it's functions, gradually rendering the circulation languid, of course impeding the various secretions and excretions, particularly by the skin, and rendering the blood thin and pale; whence proceed various severe diseases, particularly dropsy,—partly owing to the fluids being too much attenuated, and their motion languid,—

partly also to the debilitated and relaxed state of the solids. Oftimes also the body becomes very corpulent from too frequent blood-letting, of which an explanation has been already given elsewhere (104.); and what is still more astonishing, but no less true, the frequent use of this evacuation induces plethora; which perhaps can be no other way accounted for, than that the body being at once relaxed and debilitated (513.), more easily admits of a superabundance of fluids, and is inadequate to the exercise of those functions by which it should defend and relieve itself from so great and noxious a load.

1577. From the various effects of blood-letting which we have now mentioned (1571, 76.), it is evident that it would sometimes be useful in all cases of plethora, not merely in the genuine or absolute, but also in the spurious (521.); in plethora ad spatium (520.), or in that ad vires (522.), and in every disease proceeding from plethora, or of which it is a part; that the salutary powers of nature being relieved from such impediment, may be more adequate to their functions; also in all irregular distribution of the blood, and morbid congestions of it in certain parts, excessive impetus, or excessive action of the arteries in any particular part, as in inflammation (376.); also in some impediments which obstruct the free circulation of the blood, especially through the heart and lungs, as in various obstructions and other faults of the large vessels, or of the heart itself; in difficulty of breathing, in almost every species of which bleeding affords some degree of relief, though for different reasons sufficiently manifest, it is not always a proper remedy; frequently also in great pain or severe irritation, as that produced by calculus in the kidneys or bladder, violent gripes, strangulated hernia, or wound, contusion, fracture, luxation, &c. with the intention both of alleviating the pain and thus allaying the irritation,—and also of relaxing the arteries and veins, and indeed all the parts of the system, that the cure of certain disorders may be facilitated, and the danger of inflammation or fever may be avoided; and, in short, in that singular irritation, or rather unknown state of the brain and nerves, which seems to take place in persons deranged, without any symptoms of plethora, inflammation, or fever.

1578. Bleeding indeed, for the same reason as in the other evacuations, but generally more quickly and to a greater extent, is very frequently hurtful to patients flaccid and relaxed, infirm and irritable ; to those who have been already broken and exhausted by long abstinence, by the use of food of bad quality or little nourishment, by severe or protracted diseases, or by large evacuations ; and especially to those who labour under putrid diseases, either with or without fever.

1579. It is more frequently necessary or useful in that class of diseases, by nosologists termed pyrexiae, less frequently in those called nervous, and least of all in the cachexiae. But no certain and uniform rule on that head can be laid down. In fact, in many fevers and similar diseases, it is neither necessary nor safe to let blood ; in many diseases of the nervous system it becomes a most useful remedy ; and even in some of the cachexiae, it is on various accounts not without it's use.

1580. Since letting blood produces so many different effects on the human body (1571, 76.), some of which are very useful, while others would be very pernicious to the same patient, it is plain that some degree of prudence is necessary in employing so ambiguous a remedy, even in the more simple diseases in which it's aid is required. But in complicated and mixed diseases, such as generally come under our treatment, still greater circumspection is requisite, because some symptoms of disease require bleeding, while others forbid it ; or in a case much more frequent, and nearly of equal importance, when, from the nature and usual progress of the disease, the practitioner is fully apprised that the present symptoms which require blood-letting will terminate in a short time, and that new ones, contrary to the former will quickly supervene, to which this evacuation is most inapplicable. It must also be always borne in mind, that there is often more mischief done to the body in a moment by letting blood improperly, than all the skill of the most eminent physician, and all the resources of the medical art can afterward compensate. For as blood once drawn never returns into the veins, so in various diseases, the powers lost with it can never be restored.

1581. Thus in plethora, though manifested by the most decisive symptoms, it is generally improper to let blood, unless the case be very urgent, or some more violent disease has either seized the patient already, or at least is evidently approaching, as fever, haemorrhage, inflammation, apoplexy, hysteria, or epilepsy. For though it be the most prompt and certain remedy for such a disorder, it is commonly found to be but a short, and in some sense an equivocal relief; because it relaxes and weakens the system, and checks the excretions,—both to such a degree, that in a short time there is a new accumulation of blood in greater abundance, and, considering the state of the body, in general more noxious than before. Wherefore, in every case that admits of delay, it is necessary to remove and prevent plethora by methods entirely different (516.), slower indeed, but safer and more to be depended on.

1582. For a very similar reason, blood-letting is much more seldom proper in epilepsy and in hysteria than some practitioners believe ; for though it be not at all doubtful, that a plethora, in some part at least, frequently produces both those diseases, and that venesection would be almost an immediate remedy for this disorder ; yet the body will not only become more disposed to such plethora (1576.), but more irritable, through the weakness and relaxation which the loss of blood commonly produces. Nor in fact is it a rare occurrence for a remarkable irritability of the system and genuine hysteria to be induced by copious or repeated bleedings.

1583. Farther, it is not always proper to let blood in many diseases in which the impetus of the blood, and heat of the body become excessive from the excited action of the heart and arteries; since that state is frequently combined with great debility, or at least soon terminates in it, as in different descriptions of fever, both intermittent and continued; sometimes also the same state inclines to putrescence, as in certain fevers, confluent small-pox, or cynanche maligna; therefore in these and similar cases, how urgent soever they may seem, blood-letting must either be employed with extreme caution or not at all; because such evacuation, which to a practitioner of inferior caution might seem absolutely necessary in the first stage of the disease, would afterwards, for the most part, by it's debilitating effects, prove not only useless but exceedingly noxious.

1584. Wherefore, seeing blood-letting is so ambiguous a remedy even in those diseases which seem at first sight to require it most; in doubtful cases especially, it is sometimes necessary diligently to consider and weigh many circumstances, even very minute ones, which may indicate that the evacuation is necessary, useful, or at least safe,—or on the other hand quite useless and pernicious.

1585. To these may be referred particularly the different conditions of the body, the age, sex, constitution, strength, and habit; also many external circumstances, climate, season of the year, diet, and mode of living; in short, the nature of the disease, it's origin, or stage, the remedies already administered, and the salutary efforts of the vis conservatrix naturae, &c.

1586. Thus persons in youth or in the vigorous period of life, more frequently require and better support this evacuation than children or aged persons; also males better than females; the firm, than the soft and flaccid; and those of spare habit, better than the obese; the robust, than the infirm and delicate; and those accustomed to the operation, than those unaccustomed to it; the active, than the idle and indolent; those who live well, than those who use a spare or slender diet; and the inhabitants of cold climates, better than those of warm. It is more necessary in Winter and Spring, than in Summer and Autumn, in most diseases; in many which proceed from cold, as fevers and inflammations, it is safe and generally useful; in many which arise from contagion, it is useless and pernicious; in a recent case, whether of fever or inflammation, it is often useful or necessary; generally hurtful and dangerous, even in such disease, after it has continued long; it is seldom well supported after other evacuations, especially if they have been copious; and in every case where salutary excretions have come on spontaneously, it generally proves noxious in no small degree.

1587. It is necessary in letting blood, above all things to attend to the state of the pulse, than which there is commonly no more certain sign from which the practitioner can judge whether such evacuation would be useful or at least safe. Thus a full and strong pulse generally bears blood-letting well, if the nature and cause or other symptoms of the disease seem to require it; particularly a hard, and at the same time frequent pulse, not only bears such evacuation well, but in most diseases which are attended with fever, plainly requires it. But it is very inapplicable to a weak small intermitting pulse, however frequent, and, in fact, mere frequency of pulse (450, 455.) very seldom requires this evacuation.

1588. But as these things are not steady and uniform, it is sometimes necessary to let blood more copiously and frequently, though the pulse be small, weak, and irregular; as in certain inflammations, especially of the abdominal viscera, and sometimes of the lungs. In certain diseases of the head, as apoplexy, or fractures of the skull, though the pulse be very soft and not at all frequent, or perhaps even unusually slow, a bold and free use of the lancet must nevertheless be adopted. For in cases of this description, owing to the nature of the disease attacking a vital part and tending speedily to a fatal termination, it is evident that it threatens a greater and more urgent danger than usually attends a considerable loss of blood, with the debility and other disorders which proceed from it.

1589. Again, practitioners are in the habit of judging of the propriety of repeating this evacuation from the condition of the blood already drawn, and from the effects of the former bleeding.

1590. Thus, when the blood is thick and of a very deep red, and still more if it be covered with a tenacious buffy coat (508.), the patient will bear another bleeding in almost every disease where the other symptoms shew the necessity of such a remedy. Many diseases, indeed, in which that crust appears, absolutely require a copious bleeding ; but we must by no means trust solely to this symptom at all times, or attempt repeated bleeding till it be found entirely freed from that buffy coat, which would frequently prove exceedingly dangerous, and not seldom altogether impossible.

1591. But in all cases where the blood is thin and pale, congeals imperfectly, and after congealing appears of a livid or greenish hue, in a short time easily dissolves, is foetid and putrescent, farther bleeding is very improper.

1592. When, after letting blood once or oftener, the patient bears the evacuation well, the pulse becomes fuller and stronger than before, or at least is little weaker, and the disease is either not relieved, or after a remission, or being almost carried off, it recurs with new force ; in such circumstances it will generally be proper boldly to have recourse again to the same remedy.

1593. If, after one or more bleedings, the patients' strength suddenly sink, and that to a great degree, and the pulse become weaker and more frequent, or perhaps irregular, there will be ground to suspect that too much blood has already been drawn from the veins. But if the disease is still urgent and require such aid, blood may often be drawn with safety from the affected part by leeches or cupping-glasses (1570.), though the body could by no means bear a more copious or sudden evacuation. These remarks, however, must not be so understood, as if it were always necessary to abstain from repeating the operation if the patient bore the former one ill; for many who faint at the first bleeding, and perhaps a small one, will afterwards both require and bear very well repeated and more copious bleedings.

1594. In doubtful cases, which occur frequently enough, blood is always to be drawn cautiously and sparingly; nor is there indeed any thing absurd in some cases to make trial of a small bleeding, that it may be more distinctly seen what is the nature of the disease, and what benefit is to be expected from this evacuation. For in such cases, it is scarcely credible that the loss of a few ounces of blood can be any serious injury; while, from it's effects, which are often very manifest, and from the state of the blood itself, the practitioner may be apprized what is either to be hoped or dreaded from a larger evacuation.

1595. That syncope, which is frequently induced by the loss of blood, appears to be sometimes useful in various diseases, as in fevers, inflammations, haemorrhage, pains, irritations, spasms, insanity, &c.; nor have practitioners been wanting, especially among the ancients, who dared to take blood in certain cases till the patient fainted. But though this might sometimes be of singular advantage, it is very rarely to be tried; for the salutary effects of such syncope are by no means certain or uniform, and it is sometimes not unattended with it's own inconvenience and even danger; and besides, we can never know how much blood is to be abstracted, seeing the difference is so great in this particular between different persons (1574.). For some will faint before they have lost the quantity of blood requisite to the cure of certain diseases; others will scarcely faint, or indeed not at all, till the loss of blood would be so great as to induce the greatest and most dangerous weakness, or, in some diseases, to prove speedily fatal. Fainting during blood-letting may be induced generally with a smaller loss of blood, by drawing it from a larger orifice while the patient is in a standing posture.

1596. But it is more frequently necessary to guard with diligence against such fainting during that operation, as being useless and pernicious, especially in those who are in the habit of fainting. It is expedient for these, if they are to be bled, to use a recumbent posture; the orifice ought also to be small, and on the accession of vertigo or nausea, the flow of blood may be stopped for a little, and the strength somewhat restored by the administration of proper medicines.

1597. It has been long and keenly debated among medical men from what part blood should be drawn in various topical diseases, whether, for instance, from the part affected, those in it's immediate proximity, or from a very remote part. For many medical men have most firmly believed that a singular determination of blood takes place to the part where the vein is opened, and of course an equal revulsion of it from remote, and particularly opposite parts. But that such determination, if it do really take place, is neither so great nor so uniform as some authors believe, may be clearly seen even from this circumstance, that when a vein has been opened, the blood, springing out at first with great force, often flows in a very languid manner, or stops entirely before it has amounted to any considerable quantity, or there has been any manifest failure of the patient's strength. But it is unnecessary to discuss at more length a controversy now obsolete, and at best of very little moment. It is sufficient to know that experience has now abundantly demonstrated, what reason too might have shewn after the discovery of the true circulation of the blood, and investigation of it's propelling powers, that in every case blood-letting is most beneficial when drawn from the part affected, or one as near to it as possible. In a copious general bleeding this is of less importance, but it is of great moment in a topical one by leeches or cupping-glasses; so that in many inflammations, attended with no general fever, or only in a very slight degree, a very small portion of blood taken from the part inflamed or those very near it, either carries off the disease or affords great relief, when the most copious bleedings from remote parts would have no effect. Farther, the same mode of letting blood is sometimes proper and sufficient for curing certain inflammations, even though some degree of general fever be present; because the irritation of the inflammation itself may excite some degree of fever,—but when the former is cured or alleviated, the latter terminates at the same time or soon after.

1598. Some practitioners are of opinion that it is of no small advantage in many diseases to abstract blood from the arteries rather than from the veins; and there have not been wanting some, both formerly and of late, who have dared to open various arteries with this intention. But it is not yet demonstrated, either by reason or experience, that it is preferable to draw blood from the arteries rather than from the veins; and, in the meantime, it is fully agreed, that it is always troublesome and perhaps dangerous to open an artery, while to open a vein is an operation very expeditious, easy, and free from every danger. Besides, bleeding by the arteries is very uncertain, for in some cases it scarcely flows in sufficient quantity; sometimes it exceeds before it can be checked; patients, too, generally bear it with greater difficulty, as being more sudden; they faint more readily, and are slower in recovering. Wherefore no artery ought to be cut except some branch of the temporal one, where the operation is neither dangerous nor very troublesome: and even this artery is not to be opened unless the case be very urgent. But in a more severe disease, especially of the head or eyes, it will be proper to make trial of such means, as has sometimes appeared to be of the greatest benefit.

1599. It is probable enough that it would be singularly useful, were it practicable, to cut the artery of a part inflamed, or even some larger branches communicating and united with it. Nor indeed is there room to doubt that abstracting blood by cupping is of the greater efficacy in inflammations of any contiguous part, that the minute arteries equally with the veins are promiscuously cut by the instrument in that operation.

1600. Cautions and directions almost without number have been given by different authors concerning blood-letting, which are generally received among the people, and indeed among practitioners, many of which are so trifling and even ridiculous, that they deserve neither to be noticed nor enumerated; others are in some measure good and judicious, but must nevertheless be neglected when even any more pressing necessity urges; and, unless the case be urgent, there is seldom either necessity or benefit in venesection.—Thus, though it is by no means proper when the stomach is full, or when the menses are either present or at hand, yet, in violent fever, inflammation of the viscera, or disease of the head, &c. it is necessary boldly to encounter every inconvenience or danger that may arise from such evacuation, because a much more dangerous mischief is threatened by the disease itself. But as to what concerns the menses, it is now sufficiently ascertained that they are neither disturbed nor suppressed by blood-letting to the extent or frequency that is commonly believed.

CHAP. XLI.

Of epispastic remedies.

1601. ALL those remedies which draw off thin fluid or pus from ruptured vessels, by inflammation and suppuration, are generally termed Epispastics: particularly this appellation is applied to vesicatories or blistering plasters, composed of cantharides or other acrid substances, which, applied to the skin, excite inflammation, and, by the interposition of much thin fluid, separate the cuticle from the subjacent skin, and raise it into vesicles. But not only such thin and pellucid humour may be drawn off by the recent inflammation which cantharides excite, but also a thick white pus may be copiously educed, if a proper ointment or more acrid plaster be long and frequently laid on the part already inflamed to protract the inflammation and continue it almost at pleasure. Such perpetual blister, however, usually gives so much pain and uneasiness, that it is not at all adapted to common use; and generally more is gained by applying repeatedly new vesicatories either to the same part, if it has acquired a new skin sufficiently firm and sound, or, if otherwise, to the contiguous parts.

1602. Should it seem necessary to draw off not only a thin fluid, but true pus, this may be effected without difficulty, only somewhat more slowly, by artificial ulcers in proper places, which, by various contrivances, may be kept open, inflamed, and purulent at pleasure. Such ulcers are formed by burning, by incision, or by perforation: in the first mode, any part may be burned either with a hot iron, which, for reasons sufficiently evident, is seldom attempted, or by a caustic medicine; when incision is used, it is done with the scalpel, and a pea, a small ball of wood, or some hard substance, dipt also, if requisite, in an acrid medicine, is buried in the wound or ulcer thus made, which irritates and prevents it from healing; and the ulcer made and kept open in this way is called an Issue. In the third method, that by perforation, the skin is pierced through in two places, not far distant, with a large broad needle wholly inclosed, with the exception of the point, in a fit canula or case, and armed with a thick, soft, cotton thread: the needle being first put through, then the canula withdrawn, the thread is left in the skin, and the ends of it tied together; and it is now and then drawn and moved through the apertures to render the ulcer purulent and give an easy exit to the pus. A remedy of this description is called a Seton.

1603. There is no small difference, in the effects which they produce on the human body, between vesicatories and issues or setons: for the former draw off the fluids very suddenly, the latter quite slowly; the former are therefore more proper in acute and urgent diseases, the latter in the slow and chronic; the former produce but a small evacuation, unless in certain instances, and these very rare, when, on account of a singular state of body, there is such an incredible efflux of thin humour, that it seems sometimes to have exceedingly exhausted and weakened the body,—the latter being calculated to draw off pus which seems to be formed of the grosser, gelatinous, and more nourishing part of the blood, exhaust the body much more than in proportion to the quantity of humour which is abstracted. The former are therefore of little use as evacuants, the latter are often very useful from the nature and long continuance of the evacuation which they effect. In a word, the former communicate to the part on which they are laid, to those contiguous, and, in some degree, to the whole system, a great and sudden stimulus, sometimes very salutary, at others very pernicious,—but the latter afford a stimulus in general so feeble and of such short duration, that it can neither do much good nor harm: and all partly by their stimulus (1166.), partly by the evacuation (1342.) itself, alter in some degree the course and distribution of the blood; by averting it from some parts, especially those contiguous, and by a more copious determination of it to that part whence the evacuation is made, or on which the blister is laid. In this manner they frequently moderate and restrain the excessive and irregular topical action of the arteries, and relax the spasm, not only of these, but of other parts also. Farther, the most ample and happy experience has now sufficiently proved that epispastic remedies, duly and seasonably employed, not only exceedingly affect the skin and parts immediately subjacent, but those which lie deep in the inmost recesses of the body, in various ways bringing relief to them when labouring under different diseases.

1604. By means of these several effects (1603.), epispastic remedies are of considerable use in preventing or removing a superabundance of fluids, irregular determination or congestion, and various diseases both chronic and acute, which originate in such disorders, or are combined with them: as in certain discharges of blood, phthisis, apoplexy, palsies, general or partial, epilepsy, headach, vertigo, ophthalmia, blindness, dropsy of various kinds, especially of the head, thorax, or testes,—in the varieties of dyspnoea, catarrh, violent cough, and difficult expectoration,—in various irritations, or perhaps spasms of the abdominal viscera, colic pains, hiccup, vomiting, &c. and, above all things, in various inflammations, which, with few exceptions, are greatly relieved by blisters, applied as near as possible to the parts affected. This, indeed, deserves to be classed among the most infallible and most useful discoveries of this age; for, though some epispastic remedies were known almost from the earliest times, and were employed and recommended by some practitioners in certain inflammations, such as pain of the side, long before plasters of cantharides were in use; and though these also, for almost two centuries, had been frequently and freely applied by many practitioners in different diseases, especially in fevers; yet it is only of late that their eminent powers and utility in cases of inflammation, and the proper employment of them, has been distinctly observed. In slighter inflammation, wherein very little fever, or none at all exists, being laid on the inflamed part, they frequently suffice for carrying off the disease without blood being drawn at all; and even in the severest cases, attended with violent fever, they are found very useful, after blood has been drawn once or perhaps a second time, rendering those great and repeated bleedings less necessary, which otherwise would have been our only hope and resource; and besides, they frequently afford greater relief than the most copious bleedings, and at the same time agree very well with those who are exceedingly weak and exhausted, who could by no means bear blood-letting.

1605. It was anciently an opinion among medical men, if indeed they thought at all on such a matter, that it made little difference on what part of the body the vesicatories were applied; but experience has now sufficiently proved, that, like bleeding by leeches or cupping, they are chiefly, or perhaps solely, beneficial in inflammations, when they are put on the inflamed part, or as near it as possible. Nor indeed is there occasion for many words to shew what resemblance and agreement there is between these two kinds of remedies.

1606. It must not however be denied, that vesicatories by their stimulus frequently excite the whole system in some degree, and particularly accelerate the pulse, which seems very ill accommodated to severe inflammation, perhaps attended with violent fever; but by relieving the inflammation, they abate the fever itself in a short time: it consequently happens, that their whole benefit is not always discerned till they have been removed, and their irritation has ceased; and that they sometimes seem to do harm at first, though some hours afterwards they prove extremely useful.

1607. It is likewise agreed, that issues or setons have sometimes had no small effect in some cases of chronic and inveterate inflammation. It is clear too that a seton will draw off the pus in the easiest and most efficacious manner, when the needle perforates the containing abscess in the same way as water is drawn off from a dropsical testicle. But it is believed that pus is sometimes drawn off by issues or setons, from abscesses deep seated and remote, which they neither touched nor could touch, by the pus either being re-absorbed from it's own abscesses, and conveyed to these new ulcers, or opening to itself a channel thither through the cellular texture.

1608. From the days of Hercules of Saxony to our own, many medical men, and especially the medico-mathematicians, and no where more than in our own island, have employed vesicatories in the greater part of fevers; and persuaded both themselves and their patients that they were of great benefit in febrile diseases, endeavouring also to account in different ways for so great a benefit. This some wished to attribute to abstraction of the morbid part of the fluids (1339.), others merely to the evacuation; some to the stimulus which they give to the system, others to the blood which had been previously too thick becoming dissolved and attenuated by the cantharides conveyed into it; while others ascribe it to the relaxation of the spasm in the extreme vessels of the skin, and determination to it of the fluids formerly driven from the external parts.

1609. But ere it be worth our while to dispute about these or the like theories, it is necessary that we be assured of the fact for which we wish to account; this being much more doubtful than is commonly believed. For though it be generally agreed that blisters are sometimes useful in some fevers, by relieving several of the most urgent symptoms; many practitioners of the greatest experience deny that they have any effect as a general remedy for fever, and believe that they rather do hurt, which is indeed too well ascertained in many cases.

1610. They were thought to answer best toward the decline of fevers, and in those cases where great weakness and some stupor or drowsiness were present. But such drowsiness is not always noxious (404.), nor does it require such remedies; and when the strength is much broken down, and the circulation failing, there are not wanting other stimulant remedies, both external and internal, more prompt and efficacious, more grateful and safe. For whether that debility be combined with putrescency, or with excessive mobility, tremors, and starting of the tendons, it is evident that vesicatories ought not to be employed.

1611. It would be unjust to pass in silence in this place the experiments of a celebrated author, unfortunate indeed, but not the less useful on that account, and which he hath candidly and liberally published. This author, intent on experiments concerning the remedies of fever, neglecting almost every other means of cure, trusted several of his patients to blisters alone; but the greater part of feverish patients treated in this manner died, and no one of those who escaped reaped much benefit from that remedy, but the most part of them not a little harm.

1612. On the whole then, it is reasonable to conclude, that in pure fevers, medical practice can without loss dispense with such aid, unless the authority of certain great names should be opposed to this opinion. It will of course be better to leave the question to be settled by more extensive experience, than to decide with temerity and precipitation. In the meantime, it is useful to know that all the keenest advocates of vesicatories, at present apply them to patients under fever in a much more sparing and cautious manner than formerly.

1613. The administration and inconveniences of epispastic remedies which are employed for the purpose of a steady and continued evacuation, may be easily understood from the observations made on evacuants in general. But it must always be borne in mind, that there is frequently no small danger in finally leaving off issues or setons which have been running for some time, especially in adults, as younger subjects are generally capable of accommodating themselves more easily to such a change. For such evacuation, and singular determination of the fluids, become, by the habit of some months, or perhaps years, almost as necessary to some persons, as the natural excretions of the body, which they appear to diminish, and in some degree to supersede. Wherefore it is necessary to guard sedulously against that danger, by a proper regimen in diet and mode of living, and sometimes by other evacuations, if they shall be necessary.

1614. With respect to the use of blisters as stimulants, though many observations already made on other remedies of that description (Chap. XXX.) are also applicable to these, yet many things still remain to be noticed concerning the administration of them, which it may be sufficient to advert to here as slightly as possible.

1615. To some they are almost insupportable on account of a peculiarity of constitution, irritating and heating them in the highest degree, and with the worst effects; exciting thirst, great pain, tremors, and even convulsions. In general, the flaccid, phlegmatic, and torpid, bear vesicatories better than the firm, dry, and irritable; children, than adults; females, than males; and the inhabitants of cold, better than those of warm climates.

1616. That inflammation which they excite is sometimes attended with it's peculiar dangers, as in certain cases it very easily terminates in gangrene: as in putrid fevers, anasarca, and sometimes also in palsy. They ought scarcely ever to be applied to limbs dropsical or affected with putrid diseases; and the paralytic limbs to which they are applied must be frequently and carefully inspected.

1617. It is certainly not their least inconvenience that they so often excite a very troublesome strangury. This effect, which is frequent in the case of adults, and very rare in children, is evidently to be ascribed to some particles of the cantharides being absorbed into the blood, and thence carried to the kidneys and bladder;

and not at all, as some would have it, to the irritation of the skin itself communicated to those parts. It takes place chiefly when the part on which the plaster is laid has previously been cut, as when vesicatories are applied after cupping with scarification, or to the head lately shaven and somewhat lacerated with the razor. Strangury also happens in some cases where the skin was previously very sound, by the plaster being permitted to remain on it too long, till it is almost ulcerated; wherefore, when it is practicable, the head should be shaven the day before the vesicatory is applied; and the small scars, if any, or wounds of the scalpel, in other parts where cupping with scarification had been previously employed, are to be carefully covered to defend them from the cantharides. Above all things care must be taken to have them seasonably removed, for in general the greatest benefit of them will be obtained if they have but produced inflammation, and somewhat elevated the cuticle, and all irritation beyond that does harm. Nor is the labour entirely lost in covering the plaster itself with a piece of thin linen. It is also of use in abating strangury to take some mild diluting drink, which frequently either prevents it entirely, or removes it after it has come on; to this effect there is seldom occasion for copious draughts. Some think that camphor, either mixed in the plaster, or taken in a very small dose, is the best defence against strangury, which cantharides would otherwise produce. The cuticle, elevated by vesicatories, is by no means to be taken off, but left till it dry and fall off spontaneously, while a new one is growing in it; that the uneasiness of the itching may be less, which to many patients would otherwise be almost insupportable.

1618. Cataplasms of white mustard, and of many other acrid vegetable substances, are entirely free from this inconvenience. With the exception of the evacuation, these usually produce almost the same salutary effects as blisters, and far excel them in many cases; being not only unattended with strangury, but affording a much more keen and speedy stimulus, and capable of being more frequently repeated. Farther, this sort of rubefacients, as they are termed, may with ease be managed so as to ulcerate the skin ; and vesicatories may, without inconvenience, be taken off when the skin is only inflamed, and the cuticle not raised into vesicles.

CHAP. XLII.

Of anthelmintic remedies.

1619. Having considered the various classes of remedies, which correct the different disorders either of the fluid or solid parts, and which effect the several evacuations ; it remains that we now attend to those which operate against worms lodging in the intestines, and calculi stopping in the urinary passages ; for such means cannot be referred to any of the classes already enumerated.

1620. Remedies which are useful against worms are by medical men called Anthelmintics. Various kinds of worms inhabit the intestines : first the teretes, or long and round,—the flat, tæniæ, or tapeworm,—the ascarides, and the cucurbitini, which last, however, are always to be considered as portions or joints of the flat lumbricus, detached and coming away. Other kinds are sometimes observed in the intestines, and several of the species in other parts of the body.

1621. Farther, the origin of the worms which most frequently occupy the intestines, and their entrance into the body, are hitherto little understood ; as they are not only found in children supported by the mother's milk alone, in the newly born, and, as is alleged, in the foetus yet in utero,—but differ in kind from earth-worms, and are either never or very rarely discovered but in the bodies of other animals.

1622. It has been the opinion of many medical men that the mucus of the intestines, being in too great quantity, and perhaps in a morbid state, forms a nidus to them, especially by receiving and cherishing their eggs till the worms are hatched: but this is not ascertained; for though children are more frequently affected with worms than adults, it is by no means evident that their intestines abound more in mucus. The mucus also, which is often voided with the faeces, by persons afflicted with worms, may be an effect rather than the cause of the disorder, owing to the intestines being hurt, weakened, and in no small degree irritated by these troublesome inmates; besides, worms themselves abound in mucus, and that which is voided may possibly be in a great measure derived from their own bodies.

1623. It is also believed that children and even adults who are weak, sickly, accustomed to a bad diet, air, or mode of living, being consequently liable to indigestion and languid motion of the intestines, have worms more frequently than those who are sound and vigorous, who enjoy wholesome food and air, and much exercise. This, indeed, is very probable, but it is neither certain nor uniform; for many in boyhood, whose whole life has been nothing but a long disease, have nevertheless lived free from worms, while others, sound and robust, have often passed them by the anus.

1624. Though many medical men, both formerly and of late, even from the most ancient times, have studied this subject, it is yet very difficult, perhaps impossible, to judge with certainty whether worms be present in the intestines, unless some of them have been voided either by the mouth or by the anus. Many animals very rarely, if ever, are free from such inmates, and in general they suffer no harm from them. Not a few of the human race too, especially in boyhood, have worms, though in other respects in the best health: nor could any one easily say what children are free from them. Hence some have been of opinion that in many cases worms are scarcely to be reckoned a disease; and that they only do hurt when, through their numbers, their aliment becomes deficient, or when, in a disordered state of the body, they irritate the intestines, and perhaps corrode their habitation. But though this sometimes happens it is very rare.

1625. They however often do the body very serious injury, though neither very numerous nor in want of aliment. Of the almost innumerable morbid symptoms which are said to proceed from them, the following are commonly the most frequent and of the greatest importance. The stomach and intestines are disordered in various ways, and the patient is harassed with gripes, nausea, vomiting, hiccup,—pains of the belly, stomach, and sides, which are aggravated by hunger ; at one time he is costive, at another his stools are too loose and mucous ; his thirst and appetite are very irregular, now almost gone, by and by excessive ; his urine changeable, at some times whitish, at others limpid ; the belly too not unfrequently swells, with rumblings ; the rest of the body becomes emaciated, the breath remarkably foetid, and the saliva flows in unusual abundance ; the countenance is pale, sometimes almost livid, and acquires a greenish shade, especially under the eyes ; in some cases it is now and then at short intervals suffused with a morbid ruddy glow ; a dry and troublesome cough is often present, the pulse varying greatly, with slow and distressing fever ; grinding of the teeth is often observed during sleep, not seldom more general convulsions, frequent and violent epilepsy, sometimes attended with it's consequent fatuity : in fine, worms are voided—most frequently by the anus, sometimes indeed by the mouth ; very seldom before death, but frequently after it, they perforate the intestines and even the parietes of the abdomen, and thus discover themselves.

1626. Besides these and the like morbid symptoms some explanation of which it might not be difficult to give, some others are usually enumerated by medical men, more equivocal and more difficult to explain ; such as the enlargement of the pupil of the eye, some swelling of the lower eyelids, itching of the nostrils, which infants are said to be always scratching ; a whiteness of the nose, and some unusual swelling of it, and of the upper lip :

of these symptoms the dilatation of the pupil varies greatly, being generally greater in children than in adults; the others are generally observed in strumous habits, and sometimes proceed from catarrh; and, in a word, all children are in the habit of now and then scratching their nostrils.

1627. But it is necessary to guard against an error generally received among the people, and indeed by no means rare among many practitioners, who, wherever worms are discovered, make no farther inquiry, nor give any attention to additional circumstances; taking for granted that every disorder present in the system is to be attributed to them alone. There are not wanting, however, many arguments and observations which go to prove, that, even in persons abounding in worms, these are often the least, perhaps sometimes no part of the urgent disease; the practitioner, therefore, must by no means neglect other remedies, with the view of directing his whole attention to their expulsion.—But there is scarcely room for reasoning with those who seriously profess that they impute to worms almost every unusual disease, especially of the nervous system, occurring in young persons, every one which is obscure in it's nature and origin, and of more difficult explanation,—and that of course they direct to this point every indication of cure.

1628. There are various kinds of medicines of use against worms, which seem to operate in different ways; some hurt and lacerate their tender bodies, some poison them, others merely weaken and stupify them, or are so disagreeable to them, that of their own accord they abandon their dwelling; others again neither hurt, poison, weaken, nor stupify them, nor render their abode irksome, but expel them by mere violence. In fine, such medicines are given as tend to destroy and eject their nidus. Nor is it an absurd or inefficient plan for preventing or removing worms, to provide diligently, by proper regimen, and sometimes by other remedies, for the general health of the body, frequently undermined in different ways.

1629. But many of these are too fine and ill adapted to common use; and what is worse, and more to be regretted, the proper remedies, requisite for such a plan of cure are not so ready at hand as is commonly believed. For it is not well ascertained what is grateful to worms, and what is disagreeable, or what may weaken, stupify, or kill them, for on these points there are observations and experiments in opposition to one another; and great numbers of medicines, which are infallibly destructive to worms expelled alive out of the body, can scarcely be employed internally, being no less destructive to man himself: and with respect to their nidus, it is not at all ascertained of what kind it is, how it is to be destroyed, or what diet is either favourable or hostile to it's production.

1630. The most celebrated of those medicines which are supposed to hurt and lacerate the worms by their asperity, are powder of tin, filings of tin or iron, or rough powder of coral; to which must be added a remedy extolled of late, commonly termed cow-itch, being the down, or rather spiculae, which grow on the pods of a certain tree, a native of Jamaica, called the dolichos pruriens. It is alleged that even common sand has sometimes been given with the same indication, and with happy effect. There are not wanting, however, some, who think that tin, and indeed iron also, being dissolved in the gastric juices, become rather a poison to the worms; for the sulphate of iron itself is often given as an anthelmintic, and commended by some, and common tin contains in it no small portion of arsenic.

1631. But in regard to medicines which have been supposed to poison worms, or at least to weaken and stupify them, they have been brought into notice at different times almost without number, which deserve neither to be employed nor enumerated, possessing in reality no efficacy; as the root of the male fern, which has of late been highly commended, and the use of it revived after it had been long and deservedly neglected; for whatever benefit seems to have been derived from it, and other things similar, is evidently to be attributed to other much more powerful medicines, administered at the same time or a little after.

1632. The most efficient medicines of this kind (1631.), though even these are far from infallible, are, the cabbage-tree bark, the root of the Maryland pink, also many bitters, the leaves of southernwood, or wormwood, leaves and seeds of tansy, wormseed, flowers of the hop, and flowers and leaves of the peach; also certain metallic preparations, particularly of mercury as it's muriate, and the sulphate of iron; the sulphate of copper is indeed infallibly poisonous to worms, but it is scarcely less hostile to the human body, and of course not a fit remedy; common salt, honey, oil, ardent spirits, especially acetous acid, and lime water, have by many been alleged, either to kill worms, or to injure them so much, that they may with greater ease be thrown off afterwards. It is to be observed that some even of these remedies have considerable effect in relaxing the bowels, without the addition of any other cathartic.

1633. Some foetid medicines are often ordered against worms, being believed to be either noxious, or at least so disagreeable to them, that they either go off of their own accord, or are more easily displaced by cathartics. The chief of these are assafoetida, garlic, flowers of sulphur, wild valerian, rue, savine, &c. These, indeed, when taken by the mouth, usually have little effect, but more when injected as clysters into the intestines, particularly against ascarides.

1634. But of all anthelmintics, cathartics are by far the best and most efficient, especially the more drastic medicines; as, scammony, jalap, aloe, rhubarb, &c. either unmixed, or still more decidedly when joined with some portion of submuriate of mercury. The more powerful cathartics are requisite for expelling worms, because these in some measure fix themselves to the intestines, and cannot be displaced from their lodging but with much greater difficulty than at first sight might be reasonably expected. But sometimes the milder purgatives, such as sea water, medicinal purgative waters, particularly those of Harrowgate, when long persisted in, answer tolerably well, especially against ascarides. If worms occupy the stomach, it will be necessary to give emetics; but if they be lodged in the lower intestines, proper clysters composed of oily and foetid medicines, and of drastic purgatives, are to be often injected into them. It is said that tobacco employed with this intention has sometimes been of singular advantage, either in the form of smoke or decoction. It is also said that it has sometimes answered well to besmear the bellies of children affected with worms with proper anthelmintics, especially cathartics. But one ought by no means to trust to the administration of such remedies.

1635. But, in the meantime, other auxiliaries against worms are not to be omitted; for though the chief dependence must be on cathartics, these, especially the more drastic kinds, cannot be frequently repeated; and besides they will have more effect, if the worms are first killed, hurt, weakened or stupified by other means: other medicines (1630, 2, 3.), therefore, are properly interposed between the purgatives, which may satisfy the patient, and also exert any anthelmintic powers which they possess.

CHAP. XLIII.

Of lithontriptic remedies.

1636. Among the principal causes of diseases, calculi have been already enumerated in the proper place (63.), and some account has been given (745, 50.) of those, which, being produced in the kidneys, and detained there, stopping in the urinary passages, or descending into the bladder, and increasing in size during their stay there, injuring and irritating it, or at last sliding down to it's neck, and pressing on the origin of the urethra, produce numerous and exquisite tortures: and, since, in many cases, these can neither be expelled by nature, nor removed by art, and the surgical operation for extracting them is very difficult, attended with the keenest pain, and, in fact, with no slight danger to life, and consequently cannot in many cases be advised; there is evident occasion for such remedies as may dissolve, break down, or in any way comminute and expel them; and such medicines, whether already discovered, or to be discovered in future, are called Lithontriptics.

1637. Although in every age medical men have been eagerly in search of such remedies, and some in various periods have employed different medicines with this intention, and given them a very ample commendation, they have made so little progress in this matter, that almost all the remedies which they have proposed for this purpose, have, on trial, been condemned and rejected as inefficient and often pernicious; and the wretched patients have been constrained either to trust themselves to the dreaded operation, or to struggle during their whole life with a disease cruel, incurable, and more exasperated every day.

1638. But, at length, when physicians were nearly despairing of such remedies, or perhaps little thinking of them, the British parliament, for the public benefit, and at a very high price, purchased of a certain old woman her secret, which for almost twenty years she had employed for breaking down calculi in the human body; and, as she affirmed, with the happiest success. The parliament had entrusted the investigation and trial of the powers and uses of the so highly extolled remedies to the accuracy and fidelity of some physicians and surgeons of respectability and skill, with other persons of the greatest integrity: these gave their testimony, an unbiassed one doubtless, but perhaps rather incautious, in confirmation of her remedy having really dissolved calculi in the bladder, and completely freed some calculous patients from their disease.

1639. As for the absurd farrago of medicines which she made public, though little deserving such recommendation, and over and above so nauseous, that even the most resolute were often incapable of persisting in the use of it for a sufficient length of time,—and many of the most timid chose rather to trust themselves in a surgeon's hand, than daily to swallow so horrible a medicine; it was nevertheless not without it's use: it brought some relief to several patients; and, what was of much greater moment, excited not a few medical and scientific men to investigate such medicines; that they might either reduce the same into a more simple and less disgusting form,—or furnish themselves with others of the same, or of a different kind, more efficient, safer, and which the stomach could more easily bear.

1640. To these persons it was quite evident that the whole mass was easily resolved into quicklime (and that coarsely prepared,) and soap: and the woman herself candidly acknowledged, that the shells which furnished the lime were her primary remedy; that the soap was added afterwards to keep the bowels moderately open, as they were otherwise liable to severe constipation from the use of the testaceous powder,—though after extensive experience she was now fully convinced that the soap also conduced not a little to consume and carry off the calculi; and that she had added the remaining ingredients to the mixture with no other intention than that of concealing her secret from the inquisitive.

1641. It was also soon discovered by the industry of physicians and philosophers, that quick-lime may be very safely and very conveniently administered in the form of lime water; which being properly prepared possesses a remarkable power of dissolving calculus without the body, as is abundantly clear from innumerable experiments: and it was supposed to be very much adapted to internal use, containing the lime diluted and greatly attenuated by a large proportion of water,—that being with more ease and promptitude conveyed into the blood, it might reach the kidneys and bladder; while, without in the least impairing the salutary powers of lime, the mass of water suffices to defend the body from it's acrimony, which would otherwise injure it,—at the same time washing in it's progress all the passages and receptacles of the urine, it forthwith carries off the fragments of the calculi which are reduced by the lime, the gravel if any be present, mucus, blood, every thing, in fine, that might prove a nucleus to new calculi. It is also the opinion of some, that lime water is exceedingly useful in ulcers and severe irritations of the urinary organs, which are frequently familiar and very troublesome to calculous patients,—greatly relieves the morbid affections of the stomach and intestines,—proves an excellent corrective of certain disorders of the whole mass of fluids,—and is very favourable to the general health of the system: nor have there been wanting advocates for lime water, who expected from the copious and continued use of it, that the state of the blood, and consequently of the urine secreted from it, would be so far altered, that the latter having acquired a new nature, should no longer contain any calculous matter, or deposit the usual sediment; but rather prove a diluent, and flowing over the calculi, should dissolve them, and wearing off the points, polish what was previously ragged and angular,—till being at length softened and washed down into minute fragments, they would finally be passed in the form of mere sand. And to give more weight to this reasoning, many cases have been given to the public, confirmed by suitable attestations, of patients who, being freed by the use of lime water from morbid affections of the stomach, and from many other diseases, had regained good and steady health,—and passed urine in abundance, which deposited not the usual red and calculous sediment, but one that was thick, whitish, and mucous,—not only not augmenting, as natural urine would have done, but evidently comminuting calculi on which it was poured without the body; who had also voided with the urine a vast quantity of gravel, and many not inconsiderable fragments, scales, and even nuclei of calculi; and who appeared at length to be quite free of calculus, or at least the increase of the concretion being arrested, they had carried it in the bladder for many years with little, or sometimes with no inconvenience.

1642. But in the investigation of the powers and action of soap, they came readily to the conclusion, which was made still more manifest by many observations and experiments, that it's oil had no lithontriptic effect; and that, if the soap really possessed any such quality, that benefit was to be wholly attributed to it's other element, the caustic alcali, and, in the opinion of some authors of no mean repute, to certain fiery and very acrid particles, which it had received from the lime with which it had been mixed. In a short time it was also found by very simple and very decisive experiments, that in dissolving calculi without the body, both soap and lime water, and the former diluted with the latter, were nothing compared to the pure caustic alcali. It is also quite clear from the writings of certain medical men, that the fixed alcaline salts, potass and soda as they are now named, prepared in various ways, had for some centuries been in use for expelling calculi, and that they were not without their share of praise.

1643. Nevertheless, while the pure caustic alcali was neglected, or employed very seldom and only by a few practitioners, both soap and lime water have for some years been frequently used in large doses, and in various ways; under an apprehension, no doubt, that the pure alcali might be poisonous, or at least might prove so acrid, that it could not be received into the blood, nor, however diluted, reach the kidneys and bladder. Besides, practitioners indulged the hope, that more of it might be received into the system in the form of soap, than could be otherwise thrown in: some were also pleased to impute several other very salutary effects to the soap; nor can it be doubted that it would at least have the effect of relaxing the bowels in a moderate degree.

1644. At length, however, a physician, more attentive to interest than to his good name, or to the rewards attending science and worth, obtained some celebrity and great emolument, having advertised that he possessed a secret remedy which could easily and completely dissolve and expel the stone, though inveterate and long detained in the bladder,—which could be taken even by the more delicate without disgust, and long continued without inconvenience or danger; and that he desired nothing more than that his patients should remunerate him as became persons who, by his medicines, had been relieved from the dreadful disease under which they had previously laboured.

1645. This remedy, so highly extolled, accommodated only to the wealthy, of no use to the poor, and so costly that it could not be sold but for a high price, he industriously kept a profound secret; by mixing up with it other medicines which might impose on the senses, and diluting all with veal broth, lest, if dispensed unmixed, it might have been subjected to such investigation as would easily have unveiled the mystery.

1646. But his great caution availed him little, what he dreaded soon happened; and it was ascertained by simple experiments, that the precious nostrum was nothing else than the caustic alcali, more or less diluted as the occasion required.

1647. This remedy, then, though long the subject of greater commendations than it by any means deserved, has nevertheless, for some years past, been received among practitioners, frequently employed, and sometimes apparently with advantage to calculous patients; and has not improperly occupied the place of soap almost entirely, and that of lime water, in great measure, in those diseases. Nor has much improvement been made in preparing or administering it, except that chemists have pointed out a method by which it may always be made of the same strength and efficacy, as caustic as possible, and in a fit state for being diluted with proper mild and glutinous liquors at the pleasure of practitioners, and accommodated to the necessities of the various patients.

1648. In a word, the effects of medicines of this kind (1640, 47.), and particularly their lithontriptic powers, are not easily defined. For in general the more that medical men have reasoned about their nature and action, the subject has become more obscure and more difficult to be understood; the more numerous the attestations that are published concerning them, the less they are credited; in fine, the more that experiments and observations on their powers have been multiplied, the more doubtful has it been what effect they really have on the human body; nor after seventy years now spent in disputing, making experiments, and writing on these remedies, has any thing been hitherto known to effect so much as fit judges attested concerning the old woman's ridiculous medley, as it was first given to the public.

1649. For such inconsiderable progress, and so many uncertainties, in a subject so obvious and easy to be investigated, many reasons may be assigned not unworthy of being explained, that medical men and philosophers may for the future be more on their guard against similar mistakes. In the first place, for many evident reasons, attestations to secret remedies are scarcely ever to be trusted: therefore, those which were advertised concerning these remedies, before their composition was made public, are of no account, and the more recent and credible only are entitled to consideration. Even such of these as seem to be the most decisive are not always to be depended on, nor does it deserve implicit credit, that a calculus has been comminuted in the bladder, and been discharged from it with the urine, merely from the circumstance, that having been manifest before the use of certain remedies, it cannot after such treatment be detected by sounding, and no longer gives pain or inconvenience to the patient: for numerous cases shew that this may take place while the calculus still remains in the bladder; either by forming to itself a small sac in which it is concealed, by adhering to the bladder so firmly that it cannot be detected, by merely escaping the touch of the surgeon when sounding, or by having it's rough and angular exterior rounded and polished, doing less hurt to the bladder, which is possibly rendered somewhat callous by its perpetual friction.

1650. Farther, when medical men first began to reason concerning the nature and powers of such remedies, they fell into many serious mistakes, and involved themselves in inextricable confusion; which truly is not surprising, since the true nature of quick-lime, and consequently of the caustic alcali, was at that time very imperfectly understood. It had been demonstrated by the very elegant experiments of a celebrated chemist, that these substances are rendered caustic solely by expelling their fixed air, or carbonic acid, as it is now called, and become mild again, by having the same restored. These discoveries were nevertheles so far neglected, that after much experiment and reasoning, the least doubt appears not to have been entertained, that lime and alkaline salt, not only pure and combined with no acid, but still in it's caustic state, might pass through the stomach, intestines, lacteals, heart, and lungs, to the kidneys; be conveyed with the secreted urine to the bladder, and dissolve the calculus remaining there in the same manner as when poured pure and undiluted on a fragment of it without the body.

1651. But reason evidently teaches that this is impossible; and some late experiments have shewn, that neither the mild alcali, though pure and little diluted, lime water, nor caustic alcali mixed in sufficient quantity with recent urine, though they have not been subjected to the action of the stomach and lungs, dissolve the fragments of calculi in the smallest degree. Therefore, only those experiments and observations deserve consideration which have been made either without or within the body with the urine of persons in the free use of such remedies, when at any time given with a view to a cure rather than for an experiment.

1652. But even all of these are far from deserving credit, nor indeed can they possibly receive it; being so opposite and inconsistent with one another as to make it very evident, that the most part of medical men who have laboured in these studies, have looked on their own experiments with too partial and credulous eyes, an error too frequent in medical practice: and have judged too hastily and rashly of the powers of remedies; evidently unmindful of the admonition anciently tendered by Hippocrates concerning the fallacy of experiments and difficulty of forming a judgment.

1653. Lastly, they did not always consider that calculi are of different kinds, varying in some degree in their nature and chemical composition; some being very hard, smooth, and very difficult to comminute; others, again, being rough, softer, friable, gravelly, and perhaps ready gradually to fall down spontaneously in tepid water; while others are easily dissolved in other liquids, or in chemical menstrua: therefore, what is true of one calculus, or of one patient, can by no means be expected, or believed in all.

1654. It is however agreed by those who have written on this subject, that some things are sufficiently known and investigated concerning the powers of alcaline remedies. In the first place, by the abundant use of lime water or alcalines, the urine is not a little changed, and it lets fall or contains little matter truly calculous; so that instead of the usual red and sandy sediment, it deposits it whitish, mucous, and soft; and if any credit is due to the writings of physicians or the testimony of others, so far from augmenting the fragments of calculi on which it is poured, as natural urine would do, it seems in certain instances, for it is not uniformly the case, evidently, though very slowly, to comminute them. But caustic alcali used in large quantity, either in the form of soap, or taken pure, evidently renders the urine alcaline, and therefore more stimulating; frequently irritating severely the urinary passages, especially when already inflamed or ulcerated by the attrition of calculi, or by any other cause; and consequently it cannot be employed in many cases of calculus, though much diluted, and mixed with glutinous substances, and of course must always be administered with caution and prudence. On the contrary, lime water, though largely drunk for a long time, neither renders the urine alcaline nor acrid, nor irritates excessively the kidneys or bladder, but frequently relieves in irritations of those parts, and where perhaps severe pain had formerly been present. It is also agreed, that if given with prudence, each of them may be taken for a considerable time in large quantity, without affecting the general health. But it is alleged, and is not at all improbable, that by an incautious and excessive use of them, the whole system is in various ways injured, and particularly the fluids acquire marked putrescency. It is likewise certain, that various disorders of the stomach and intestines, especially acidity, in many cases familiar to calculous patients, have either been entirely removed by the use of such remedies, or, at any rate, greatly relieved. In short, it must not be denied, that by the use of these, many patients have obtained very considerable relief from disorders proceeding from calculous matter in the kidneys and bladder; and that, in some cases, numerous calculi and much gravel have been passed with the urine. But it is still very doubtful, whether a stone of large size, hardened by long continuance, has ever been comminuted, either in the kidneys or bladder, and completely expelled from the body. And if we resolve to credit the attestations of such cures, however ambiguous, which have been published, this much is certain, that so happy a termination is very rare, and to be expected in very few cases.

1655. Those remedies, however, are of no small utility which are capable of counteracting such a disease in it's commencement; of preventing it when it has not yet commenced, but, on account of known predisposition of the body, is only suspected; of stopping it's progress; or of only alleviating the tortures which it produces: and it is very much to be regretted, that even these benefits are not more certain.

1656. In fine, the mode in which they produce the several effects now enumerated (1654)., and attributed to them by various physicians, is neither so certain nor so clear, as many have supposed. It is scarcely necessary to take into consideration the theories concerning their action previous to the discovery of the real nature of quick-lime and caustic alcali. And after it was discovered that the caustic nature of these depended entirely on the abstraction of the carbonic acid, medical men adopted the opinion too hastily, that this would solve the difficulty. For it is not very probable that medicines so caustic can circulate with safety, and pervade freely the minutest passages of the viscera, of the lungs, in short, of the whole system, before they can reach the bladder or kidneys. Besides, carbonic acid is seldom wanting in the stomach, and is generally in so large quantity, that caustics cannot fail to be rendered mild almost the moment they are swallowed. But supposing the absence of carbonic acid there, and that while they are still caustic they are carried into the blood through the delicate lacteals and conglobate glands of the mesentery, and transmitted through the heart to the lungs, which incessantly furnish from the blood a copious exhalation of carbonic acid: here, at least, they must be rendered mild in a short time.

1657. Farther, there is usually some portion of acidity present in the stomach, and perhaps in the superior part of the intestine, particularly in calculous patients, in sufficient quantity at least fully to saturate the alcali or lime which the water holds in solution. Neither indeed is it yet demonstrated that pure alcali ever existed in the blood of a living man, nor is it probable that such a state of it could exist unattended with great and imminent danger. The urine having become alcaline, by no means proves that the blood is of the same nature, because they are the most putrescent parts of the fluids, and such as are hastening to an alcaline state that are secreted by the kidneys, which, therefore, by their retention in the bladder, may become alcaline, even in a very short time after they are passed. Besides, it is evident from experiments, that neither the mild alcali, carbonate of potass, nor the neutral salt formed of alcali and acetous acid, now called acetite of potass, have even the smallest effect in dissolving calculi.

1658. To obviate these and similar difficulties, certain medical men have advised, and some have attempted to inject, by a suitable apparatus, lime water, either pure or softened by some mild medicines, into the human bladder. In brute animals too, it has been attempted to inject in the same manner lime water, with the addition of a small portion of caustic alcali. Hitherto this has not succeeded well, and does not promise much success in future, not only because it is attended with much trouble and pain, and after a few repetitions, is almost insupportable; but it is also clear from experiments, that neither lime water, nor caustic alcali when mixed with urine, have any lithontriptic effect.

1659. Alcaline remedies, however, may in other ways benefit calculous patients,—by absorbing the excess of acidity present in the stomach, whence the digestion becomes more perfect, the system is furnished with more wholesome nourishment, all the fluids, whether circulating or secreted, are more natural, and, for this reason, perhaps the urine less calculous, the solid parts firmer, secretions duly going on, and, in a word, the health generally improved. Besides, lime water as a diluent,—and alcaline salts, either caustic or mild, or even neutralized by the acid in the stomach, as stimuli,—excite the secretion of urine, which thus dilutes it's sediment better, effectually washes out the kidneys and bladder, and expels more easily gravel and minute calculi.

1660. This seems also to be the reason of the benefit which many calculous patients have received from remedies decidedly astringent, as uva ursi; and certain medicinal waters, as chalybeates; and even from good small beer, though this last be very foreign from an alcaline nature; and none of these possess great power of dissolving calculi, and most part of them none at all.

1661. We dare not however pass over in silence some other medicines employed by physicians as lithontriptics, especially as one of them has acquired great celebrity for it's excellent qualities.

1662. A few years ago it was ascertained by some ingenious and very elegant experiments of a celebrated chemist, that carbonic acid, mixed with water, quickly dissolves calcareous earth. For lime water, which, on the addition of carbonic acid, parted with its lime, by the addition of a still greater portion, dissolved it anew, and nearly in equal quantity. In this manner other earths also can be dissolved, such as magnesia, which is insoluble in pure water.

1663. This seemed to present the physician with a favourable opportunity of making trial of a remedy, at once safe and easy in it's administration, which might dissolve calculi, and could be very easily thrown into the system in various ways; either in the form of mephitic water, such as certain medicinal springs supply very abundantly, and which can easily be made of common spring water, saturated with carbonic acid, when such springs cannot be attended or their waters obtained; or combined with a proper alcaline salt, from which, immediately on being swallowed, that acid is to be expelled by a copious draught of juice of lemon, or any other acid which may seem suited to that intention. Nor are some instances wanting in which this remedy appears to have been of signal benefit, and to have expelled great quantities of sabulous matter, even calculi, or fragments of no inconsiderable size. But it is very much to be regretted that such benefit is not more frequent and certain; though it can scarcely occasion surprise, while it is not clear by what means carbonic acid, being thus received into the body, and still retaining it's original properties, should pass through so many channels, and particularly through the lungs, and at last reach the bladder; and while at the same time it is evident, from experiments, that neither pure carbonic acid, nor water saturated with it, have the smallest effect, without the body, in dissolving those human calculi which do not consist either of lime or magnesia. Water, however, saturated with carbonic acid, and those effervescing draughts taken largely, the latter by their gentle stimulus, the former by copious dilution, may excite a flow of urine, wash the kidneys and bladder, and expel sand and calculi. Besides, carbonic acid may also be of advantage to calculous patients in some other ways (1659.), by strengthening the system, particularly the stomach, and thus improving digestion. Some experiments have also been published, which shew, that the salt which consists of ammonia and acetous acid dissolves some calculi, at least without the body.

1664. Of late also, physicians have endeavoured to give calculous patients carbonic acid and alcali at once in a different mode; by mixing the former so copiously with the latter, that it should not only render the alcali mild, but by it's acid nature, which is sufficiently evident, form as it were a neutral or medial salt with it. For in this way both the alcali and carbonic acid are very conveniently taken in sufficient quantity, diluted with abundance of water, remaining more easy on the stomach, less injurious to the system, and, what is of no slight moment, less disgusting to the patient than in any other form. Some affirm that this remedy, which is called Solution of the Supercarbonate of Soda, has been exceedingly beneficial in certain cases of calculi both in the kidneys and bladder. We may also expect an equal benefit from the carbonate of potass (of the London Pharmacopoeia) which some call super-carbonate of potass, though not much diluted. Many physicians are of opinion, that magnesia, a safe and very mild medicine, when taken in large doses and long continued, is no less effectual in calculi of the kidneys and bladder, than the most active and celebrated alcalines.

1665. Lastly, it is the opinion of some, that certain other acid and neutral salts which dissolve calculi without the body, promise some advantage within it. But no trials have been made of them as remedies, and both reason and the experience of other remedies of that kind, sufficiently admonish us to be cautious, and not expect too much.

1666. All fossile acids dissolve calculi without the body: the nitric and muriatic very effectually when they are used strong and unmixed, the latter indeed scarcely unless unmixed. But in certain experiments, strong sulphuric acid seemed scarcely to touch calculus, though when greatly diluted it dissolved it very readily. While such remedies cannot be administered concentrated and pure, and the nitric and muriatic have little effect when weak, the sulphuric alone remains worthy of a trial in calculous cases. It has been esteemed the most convenient, for other reasons, as it is altered less than the other acids by digestion or the other actions of the system, and may be safely taken in considerable quantity.

1667. Of the neutral salts, those which contain ammonia, with sulphuric or acetous acid, when diluted with water, seem to dissolve calculi without the body: but what effect they have within the body, and to what extent they, or even the sulphuric acid are changed, before they reach the bladder, must be learned from future experience. A secret remedy, celebrated of late as very highly beneficial in cases of calculus, seems to contain little of any medicine except nitrate of potass. But while so many uncertainties and improbabilities are delivered concerning remedies of this kind, of which the nature and composition are known to all, it were labour lost to spend time in considering or investigating the stories told by the vender and the vulgar concerning a secret remedy, however highly extolled.

In conclusion, whoever shall duly reflect on these notices, scanty and imperfect as they are, concerning the functions of the healthy body, concerning the origin and nature of the diseases which impede these functions, and frequently terminate fatally, also concerning the virtues and administration of the remedies which we employ for removing these diseases,—will clearly discern how obscure, and not unfrequently fallacious are the doctrines, and how rude and frequently inefficient is the art by which we endeavour to protect the frail hope of life; and will at the same time readily agree with the excellent Boerhaave, in a declaration not rashly made, "that he knew no remedy "which did not owe it's success solely to it's having "been seasonably employed."

FINIS.

ERRATA.

Page 180, line 11, *for* receives, *read* absorbs.
———— 13, *for* receive, *read* absorb.

~~3 Book of Calvin~~

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